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ENGINEERING AND MINING JOURNAL

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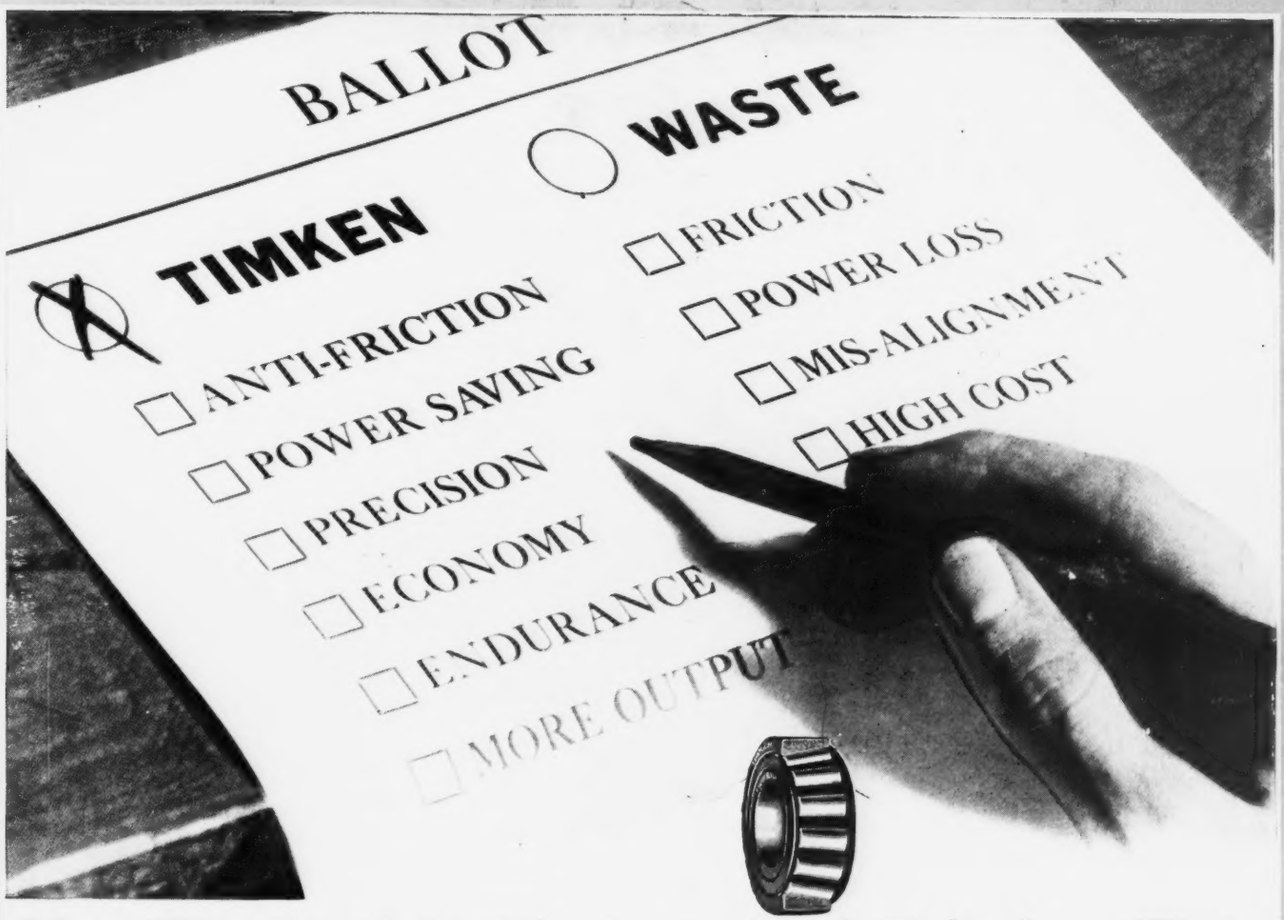

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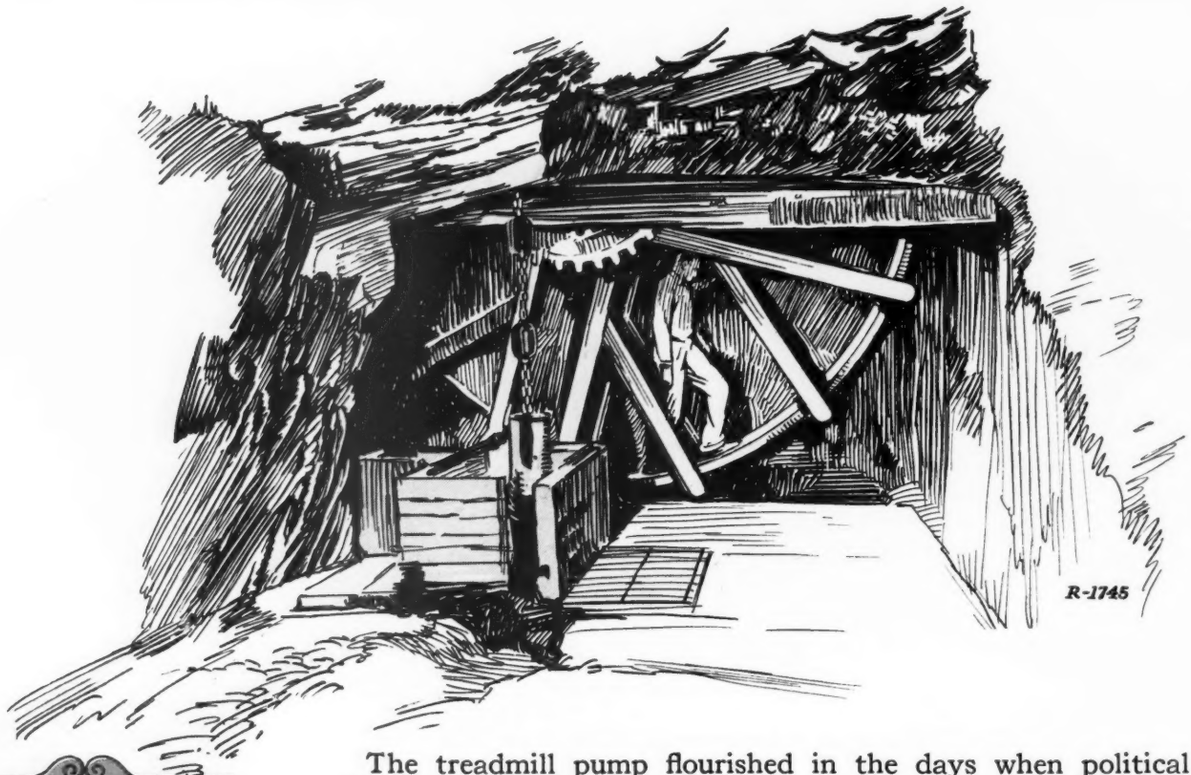

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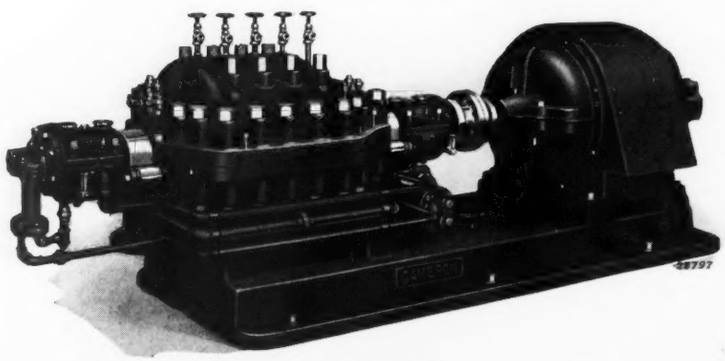

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A. W. ALLEN, *Editor*

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Contributing Editor:
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Assistant Editors:
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Where Goes All the Copper?

THE 1928 extension program of the American Telephone & Telegraph Company, costing $11,042,000, involves the use of 4,513 million conductor-feet, or 22,282,000 pounds, of copper wire in cables; and 383,880,000 conductor-feet, or 21,994,000 pounds, of copper wire in open-wire lines. Cable sheaths used will require 39,283,000 pounds of lead and 413,000 pounds of antimony.

As other nations adopt telephonic and telegraphic communication to the extent that both have been adopted in the United States, a rising per capita consumption of copper will follow throughout the world. Efficiency, convenience, comfort — advance and improvement in these respects connotes the opportunity for the utilization of increasing amounts of non-ferrous metals.

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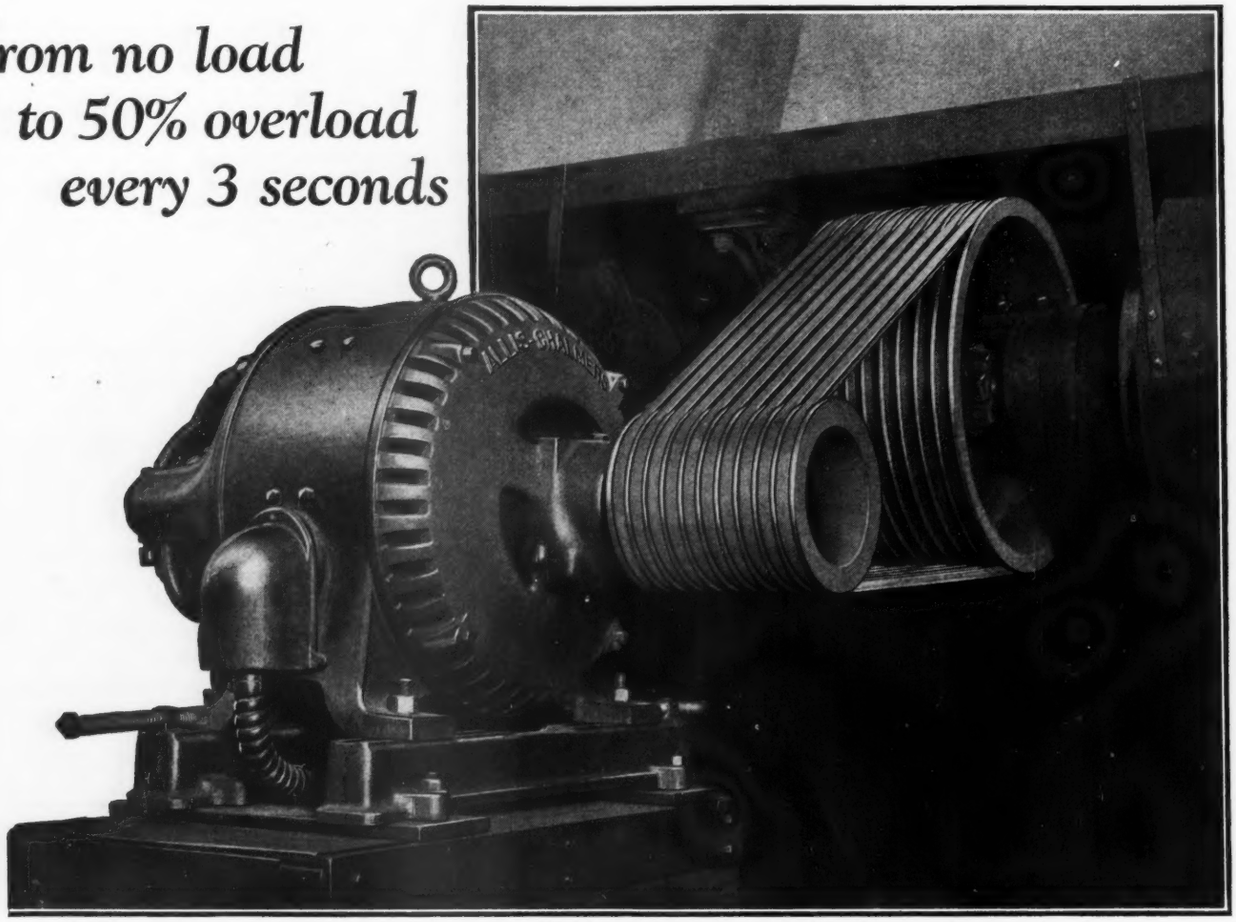

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Editor

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A Generous Expansiveness Is a Sign of the Times

"THE mind that is predominantly inquiring is expansive. It does not hold itself fixed in dogma or in absolute values. It presses out to the still unknown, aiming to extend the area of its intelligent comprehension." Thus Professor H. A. Overstreet, in his recently published work, "About Ourselves," differentiates between two types of individuals—the expansives and the contractives. On the other hand, he maintains that "The inveterately distrustful person is a contractive. He holds off others at arm's length, refuses them admittance to his councils and his confidence. He is widely distrustful—of persons, ideas, movements, motives, of the age in which he lives—he is unable to join in with anything or anybody."

These two qualities are not necessarily limited to individuals in their application. Entire industries may possess one or the other to a marked degree. When an industry is predominantly contractive, when research lags and when competition is of the cut-throat kind, that industry is on the way to well-merited obscurity and (possibly) oblivion. In a world that is continually developing and enlarging the horizon of scientific knowledge, a substitute for its product will probably be found. Science and economics, like time, are no respecters of persons.

An expansive industry, in contrast, widens the field for the use of its products; it adapts itself to changing conditions and welcomes that type of competition which promises to result in increased efficiency and economy. It strives to improve the living conditions of its workers, knowing that greater productivity is thereby stimulated. "Milk from contented cows" is more than an advertising slogan. It is a philosophy of relations between employer and employee. Above all, an expansive industry is never satisfied with itself. It does not fold its hands over a well-filled paunch and lean back in blissful somnolence.

Of which type is the metal-mining industry?

The answer, like that which can be made for most industries, is "Both." Contractive elements within the industry have been and still are in evidence. Some mining companies, especially abroad, have been close-fisted in the release of technical information. They have acted at times with an eye only to immediate profits, inclined to take advantage of conditions obtaining in half-civilized countries—to promote their own interests at the expense of others. Such indications symbolize the contractive. They are the most tenacious and hazardous obstacles in the path of economic, social, and technical progress.

But the number of contractives is on the wane. More and more the cult of the expansive is being recognized as inherently rational, in the sense that actions for both private and public gain are rational. A manifestation of expansiveness was the recent decision of the large copper producers in the West to increase miners' wages as a result of the higher prices recently prevailing for copper. The list that might be compiled of similar actions is long. Who can say, for instance, that the flower-garden contest, annually held in the Tri-State district, is not, in its small way, an evidence of desire for improvement from within? The open hand that symbolizes the open mind of the expansive must inevitably triumph over the closed fist, illustrative of the unshakable bigotry of the contractive.

Drift Mining Problem Takes on New Aspect

DRIFT MINING of gold-bearing Tertiary channels, under relatively low wages and an advantageous economic index, was at one time an important and a fairly prosperous industry in California. However, as wages advanced and conditions changed, the industry declined, and capital sought other opportunities that gave promise of better returns. Some of the drift mines struggled along, but profitable operation with gravel of ordinary grade, by utilizing the methods and equipment available, was a rare occurrence. The miners of the older period took advantage of what apparatus was available, but sufficient progress had not been made in this respect to counterbalance rising wages and the necessity to apply hand labor for most of the mining operations.

Conditions have now changed. Standardized equipment for power, rock drilling, mucking, and transportation is available. High-efficiency air compressors, drill-steel sharpeners, mechanical loaders, scrapers and scraper hoists, electric locomotives, and roller-bearing mine cars may be employed, and by their use labor efficiency can be increased to an amount sufficient to offset the difference between the wage of the present as compared with the wage of the past. Portable prospecting drills can be used in exploration work to determine the position of underground channels and their richness or leanness in gold. Magnetometer surveys have been suggested as a method for determining the position of the channels. Geological studies have facilitated a more accurate location and a more scientific exploration than was possible in times past. The mistakes often made when driving adit tunnels can now be avoided by careful preliminary work.

Facilities exist for the placing of drift mining on a modern basis, although experience must be gained in the application of new types of machines and in the

modernizing of methods. Some failures will be recorded, but it is believed that success will also be attained when mining engineers have the courage to attack the drift-mine problem by utilizing to the full the knowledge gained in the application of economical equipment and methods in other branches of ore-extraction work.

A Great Financial Journalist Passes On

C. W. BARRON, pioneer in the development of the modern financial and business news service as exemplified by the *Wall Street Journal,* the *Boston News Bureau, Barron's,* and the Dow-Jones tickers, died last week. Though not, in recent years, actively responsible for the publications of which he was the head, Mr. Barron was the founder of the policies they now pursue, and to the last he followed them with a critical eye. When he entered the field forty years ago by founding the *Boston News Bureau,* the reporting of financial news was in its infancy and the investing public was largely in the dark as to current business conditions. He quickly established new standards of excellence. It is said of him that "he regarded the prices of shares or the announcement of dividends as the merest raw material for news. He could find a dozen first-rate stories in an incident like a change in dividend, whereas the financial pages of the general newspapers found nothing but the bare fact, with a perfunctory explanation from the corporation."

The mining industry owes much to Mr. Barron's ideals; the papers he controlled are fertile sources of original material and authoritative data, not only of a strictly financial character but oftentimes embracing actual news of operations from the mining centers, with specially written articles like those that have recently appeared on Greene Cananea and Calumet & Arizona. The character of his publications is all the more notable in view of the numerous disreputable financial papers and tipster sheets that seem to devote special attention to mining shares.

Though Clarence W. Barron has now passed on, we have every confidence that Messrs. William P. Hamilton and Kenneth C. Hogate, editor and managing editor, respectively, of the *Wall Street Journal,* and the other responsible members of this group will adhere to the high standard that has been set. To them *Engineering and Mining Journal* extends sympathy and encouragement.

When Whispering Shouts of Bias and Irregularity

ON PAPER carrying the official letterhead of the United States Senate, Washington, and bearing impressive reference to a Senator well known in the mining industry and to the committees on Foreign Relations, Mines and Mining, Interstate Commerce, Public Lands and Surveys, Irrigation and Reclamation, Territories and Insular Possessions, *Engineering and Mining Journal* recently received the following letter of comment and request:

"In your journal of this date [Sept. 22] you have an article by Mr. John Hays Hammond, in which he eulogizes Herbert Hoover as an engineer; a little time ago Prof. Fisher of Yale also gives as a reason for the election of Mr. Hoover his eminence as an engineer.

"I followed mining from in the early 'nineties until fifteen years ago, when I came to Washington, but I have been a reader of your paper for over thirty-five years, and until Mr. Hoover was a candidate for the Presidency I never saw his name in your magazine.

"I wish you would inform me where and when Mr. Hoover came into prominence as an engineer, did any actual mining, opened up any mine of note or was anything more than a swivel-chair engineer.

"We have a large number who sit in New York and London and make large fortunes without ever going underground.

"I would appreciate any information on Mr. Hoover's record as an engineer."

The people of the United States have heard much in recent months about whispering campaigns. One may imagine the effect on the ignorant of the statement in the second paragraph of this letter—that our correspondent has been a reader of *Engineering and Mining Journal* for thirty-five years without seeing therein Mr. Hoover's name until he was a candidate for the Presidency. Reference to the semi-annual indexes of *Engineering and Mining Journal* would indicate to anyone interested in facts that articles by Mr. Hoover, or references to books he has written or to professional work he has undertaken, have appeared in fifty-three of the last sixty-four volumes. Since 1896, following the year of his graduation from Stanford, in only one year—1907—is the name of Herbert C. Hoover absent from the index.

Noranda Plans to Increase Its Output

ANNOUNCEMENT by the president of Noranda Mines that a new shaft will be sunk on its Horne property, in the Rouyn district of Quebec, and that the smelter's roasting capacity will be enlarged is of interest but should be properly interpreted. In no way does it furnish a reason for a further advance in the price of the company's stock. There is no reason, of course, to infer that the announcement is intended to produce this effect. The public, however, has shown itself rather too eager to discount the future of the enterprise. It should take note that, despite the large amount of work already done and the goodly tonnage of commercial ore proved, much more development must be accomplished and the existence of a large additional amount of ore, now apparently taken for granted by the market, must be demonstrated and brought into production before the enterprise can pay anything like a fair return on its present market valuation and thereafter maintain such payments.

The proposed 1,000-ft. shaft, to be sunk north of the present main opening, will permit the more rapid development of the ground between the latter and the No. 2 shaft, 1,000 ft. northwest; likewise, it will make possible the prospecting of this area more thoroughly at depth.

Incidentally, it should be remembered that the main shaft passes into ore in its lower levels, so that ultimately a new opening would probably be desirable.

Increase of roasting capacity is imperative before the second of the two reverberatories can be placed in commission, as was set forth in the article on the enterprise in *Engineering and Mining Journal* of Sept. 22. Instead of smelting 500 tons per twenty-four hours in the first reverberatory, as the designers had planned, which would have necessitated the use of four of the eight roasters provided, the company is putting twice that amount through the one reverberatory, so that it must use all eight roasters to furnish the calcine called for.

Noranda is a most promising enterprise. It is much too early, however, to declare the Rouyn district another Butte or Bisbee. If it proves to be, so much the better. But it will be still better for all concerned if the wild enthusiasm of the speculating public be tempered somewhat, lest a reaction set in that will have a protracted ill effect on the future of the company.

The Vanishing Prospector Again Visible, Momentarily at Least

LAMENTATIONS over the vanishing prospector are less audible than formerly. Either the mourners are becoming reconciled or wearied, or their complaint cannot be heard because of louder noises, or else the prospector's visibility is improving. Whatever be the reason, the change is sufficiently noticeable to warrant investigation.

The bewailing that once smote the ear came chiefly from the prospector himself. In the vanishing grubstake he found the principal source of his grief. That was only natural, for without this type of financial backing it was difficult, if not impossible, for him to follow his calling. Even the burro, venturing out alone in quest of ore, requires his customary ration of thistles, sage brush, and cactus. Those who hold that he has had more success than the mining engineer in finding bonanzas should bear in mind the fact that he has had an unfailing food supply.

The tightening of credit from which the prospector has been suffering has occurred during a period marked by the steadily increasing extension of credit by business to its customers. The prospector has been able to get liberal terms if he wished to add some household chattel to his possessions. But the beans and bacon have been harder to secure. This hits him below the belt, and the natural result has been a decrease in the number of his kind.

In some areas it is evident that conditions have improved. Where public interest in mining has been aroused, the old-time prospector has come into his own again. In the Canadian provinces, where many new enterprises are under way, the prospector has been having little difficulty in securing the desired grubstake, and the noise of his activity has spread abroad. Moreover, wide publicity has been given to geophysical work. With all this on the air it has been difficult for the Jeremiahs engaged in lamenting the prospector's disappearance to make themselves heard effectively. Their story has momentarily lost its point.

When the clamor has died down—when mining in the Pre-Cambrian shield has lost its interest for the populace, and when the geophysicist is no longer in the limelight—perhaps the voice of some one will be heard again, pressing the claim of the vanishing prospector and asserting that the reason why there are no new discoveries is because no one is willing to risk a few dollars in return for the chance to share equally in some possible bonanza.

Hollinger and Its Reduced Dividend Rate

SINCE 1911, when production started, the mines now constituting Hollinger Consolidated have made gold-production records, first for Ontario and later for Canada. Initiation of operations on a large scale became possible after 1916, when Hollinger Gold, Acme Gold, and several smaller properties were consolidated. The value of yearly output mounted steadily to a high of $15,700,000 in 1925, near which it was maintained during 1926 and 1927. Stock valuation went up accordingly, and at one time reached $120,000,000. Dividends paid have already amounted to more than $45,000,000.

Starting in the early summer of 1927, however, the value of the stock of the company has decreased tremendously. Since Aug. 27, 1927, when *Engineering and Mining Journal* commented editorially on a decline of $30,000,000 in stock-market valuation, an additional drop of $50,000,000 has been recorded, causes for which are not hard to find. Estimated ore reserves declined $6,000,000 during 1927, and since then no strike of new ore has been reported. Mill heads are much lower and tonnage handled is only two-thirds of capacity. The disastrous fire of February 9 of this year drew attention to the mine in a spectacular fashion, and the psychological effect, if not the physical one, was unfortunate. Recently word came that dividend payments had been cut in half.

On the other hand, the report for 1927 gives total assets on Dec. 31, 1927, of $36,000,000, which is only $3,000,000 less than the value of the stock at present market prices. The Schumacher shaft has recently been bottomed at 4,000 feet, and the exploratory campaign that will be carried on at that depth has promise, if results obtained in the adjoining McIntyre-Porcupine mine are taken as indications. Hollinger's project at Kamiskotia, where it is hoped to develop a large low-grade copper-gold mine, also possesses possibilities.

Apparently the Canadian investing and speculating public, which for so long a time used "Hollinger" as a byword for successful mining enterprise, is quick to drop an old favorite, preferring the glitter and the gamble offered by the newer prospects. To an expert in mine valuation, the fact that Hollinger is put at $39,000,000 while Noranda is valued at $100,000,000, Hudson Bay Mining & Smelting at $50,000,000, and Sherritt-Gordon at $27,000,000, must be rather astonishing. All the unfavorable news now seems to be out, and it would not be surprising to see the big mine at Timmins gradually regain its old prestige. By cutting the dividend in half, the directors have at least put the property in position to earn a surplus.

William Loeb, of A.S.&R., Sees Improved Industrial Relations

AN INTERVIEW BY A. B. PARSONS

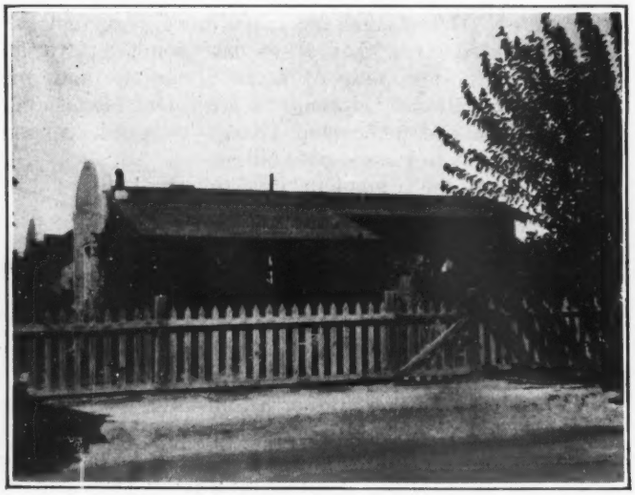
IN A GROUP of photographs on the wall of William Loeb's office at 120 Broadway is a photograph of the present Chief Justice of the Supreme Court of the United States bearing the inscription: "To my dear old 'boss' W. L., Jr.—Wm. H. Taft." The single quotes suggest that the writer did not mean precisely and literally what he said, but it is probable that he came closer to the truth than he realized. The occasion of autographing the portrait was during Mr. Taft's successful campaign for the Presidency, and Mr. Loeb was managing his affairs at Washington. Mr. Loeb's forte is getting people to do what he wants them to do without making them feel that they are being bossed. He is unusually tactful and diplomatic; and these are among the qualities that make him successful in his position as vice-president of the American Smelting & Refining Company in charge of public relations, safety and welfare, labor and personnel, taxation, and similar non-engineering and non-technical activities. As the A. S. & R. and its subsidiary companies probably employ more men in more different localities than any other company engaged in the mining industry, it may be appreciated that Mr. Loeb's responsibilities in this connection are important.

Mr. Loeb was born in Albany, New York, on Oct. 9, 1866. Completing the grammar and high-school courses there, he became an expert stenographer, and in 1888 was elected official stenographer of the New York State Assembly. Entering politics he held various positions as court reporter, becoming in 1890 private secretary to Theodore Roosevelt, then Governor of New York. That he was an exceptional secretary is indicated by the fact that he stayed with Roosevelt in a similar capacity when he became Vice-President and then President of the United States. Those who should know say that there is no greater test of real diplomatic ability than the position of secretary to the occupant of the White House. Mr. Taft, upon becoming President, appointed Mr. Loeb Collector of Customs at the Port of New York. This had always been a typical political plum; but the incumbent who took office on March 4, 1909, upset all precedent and sundry political aspirations by thoroughly reorganizing and putting the work on an efficient business basis.

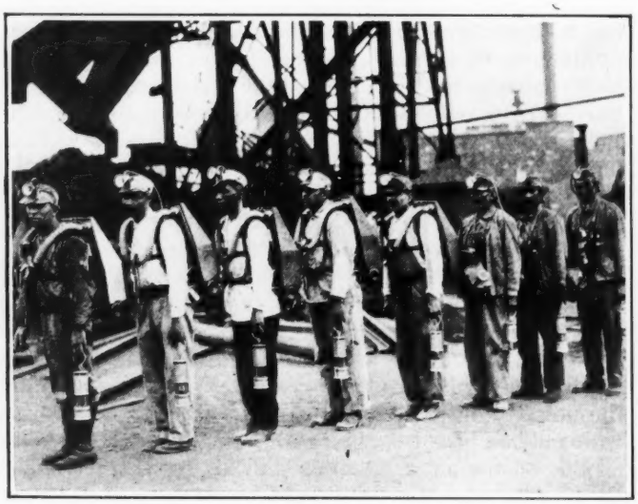
At the conclusion of his term as Collector he chose from among a number of attractive offers one of ex-Senator Simon Guggenheim, with whom he had become good friends during the Senator's sojourn in Washington from 1904 to 1908. He became a vice-president of the Smelting company on June 1, 1913; he still holds that position and in addition is vice-president and director of sundry subsidiary companies.

In the matter of industrial relations Mr. Loeb's views and actions are a well proportioned mixture of the idealistic and the practical. Fine theories are no good unless they work—and they do not work unless the result is advantageous to all concerned; that is, to the employee, however subordinate his work may be, as well as to the employer.

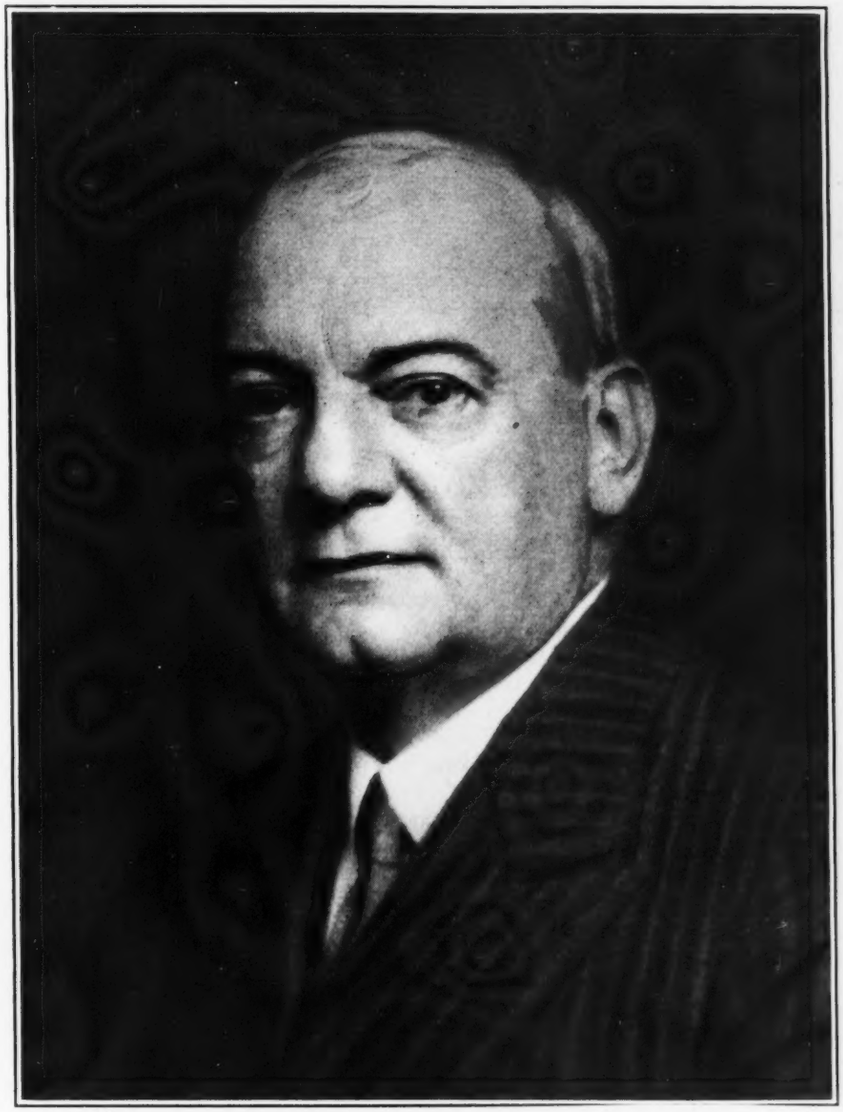
"A healthy and honest discontent, on the part of workers," says Mr. Loeb, "makes for progress in human affairs, and that employer is abreast of the times who realizes that his own best interests, material and spiritual, are woven into the well-being of those who man his industry; and that both groups are dependent upon the



Typical home for Mexican foremen in the new townsite at Rosita



Fire-fighting crew, equipped with oxygen helmets, at Rosita coal mines



WILLIAM LOEB

general prosperity of those who make use of the products of the industry—that is, the consuming public.

"To the end that there may be better understanding between employer and employee, there is a definite trend toward giving the worker more voice in certain phases of management. This may for lack of a better term be called employee representation.

"Employee representation does not depend primarily for its success upon the scope of the understanding between employer and employee: but it is vital that, having entered into it, each must be honest and frank with the other, to the full extent of their agreement.

"It is more or less inherent in men, in the interest of true sportsmanship, to be willing to swap jackknives when each is convinced of the element of honesty and fairness on the part of the other, although a shade of advantage must accrue somewhere. But the donee of a gift horse looks with suspicious eye not only upon the donor, the steed, and the intent, but he will invariably violate that ancient rule of etiquette which forbids a glance at the nag's palate. Any arrangement that savors of mere gratuity must be repellent, and will almost inevitably lead to failure.

"A plan set to paper and depending upon the niceties and subtleties of verbiage and not upon the spirit of understanding itself cannot endure. Made a football of by the narrow constructionist when it suits his purpose, and of the broad constructionist when he glimpses a mean and selfish advantage, it is but a waste of time for the parties to such a plan to attempt a square game."

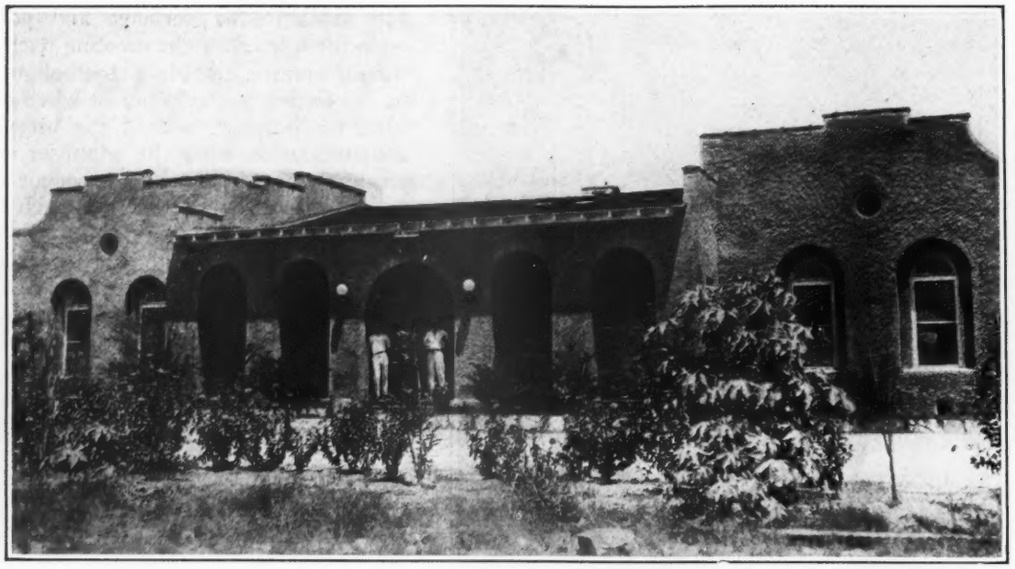
Any large industrial enterprise is more or less like an army, thinks Mr. Loeb, in that its success depends upon selection, enlistment, training, equipment, subsistence, morale, health, discipline, wise direction, and a reason for its existence.

"The first consideration in industrial relations is a wage sufficient not only to maintain the employee and his family in suitable living conditions, but to take into consideration the vicissitudes ordinarily met with in life. Indeed, the ancient formula that labor is a mere commodity and to be purchased at a price within a hair's-breadth of that needed to supply life's sternest necessities has been relegated to the limbo of heresies and economic falsehoods. The enlightened employer proclaims that economic wisdom lies in giving the highest wage the industry can honestly afford, for the stinting of labor comes back to vex production and distribution, upon which industrial prosperity and progress are founded.

"Excluding sentimental considerations for the moment, working conditions must be such—compatible with the nature of the enterprise—that the employee must be able to carry on his duties with reasonable safety and health to himself and without impairment of his usefulness to his employer. Here is a community of interest which affects both alike, and in equal measure, for a poor working condition has its reflex in a limited production and a higher cost for output.

"The health and morale of an industry is reflected by the health and morale of the rank and file who keep its wheels in operation. Dilapidation of men, as in machinery, soon spells for disaster in operation; the good housekeeper in industry knows that that is the wisest economy which provides fully for the health and well-being of the worker.

"The *esprit de corps* of an industry must always be one of its most valuable assets, and to create and maintain this calls for character that radiates understanding, justice, sympathy, a wise discipline and a cheerful observance of it, and an integrity in all things. This spirit is not and cannot be the possession of one man alone; it must be shared by the entire personnel. It cannot thrive within the walls of the mill or smelter alone, nor only within the hours of labor, but it must also have the sunshine of the outer air. An interest which goes into the homes of men after the whistle blows, which considers the recreations, the enjoyments, the domestic surroundings, is a builder of health and spirit of the first im-



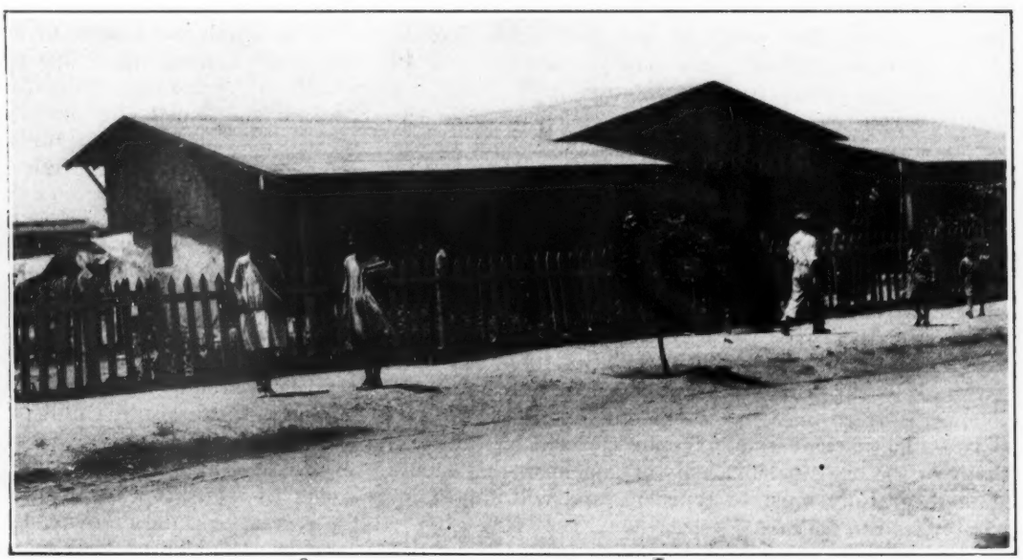
Facing the plaza at Rosita is the clubhouse for members of the American staff

portance, and a recognition of this community of interest and an observance of it is surely one of the objects of industrial relations."

Illustrative of the practical application of these theories may be mentioned some of the A. S. & R. company's activities in Mexico. At Rosita, in Coahuila, is a model industrial town. It has sewers, waterworks, schools, clubhouses, churches and a hospital for Mexican employees. A plaza and band stand, an athletic field, a cooperative store, and a public market are additional features. At the smelters at Chihuahua and at San Luis Potosi, cafeterias have been provided in recent years where Mexican employees can obtain hot meals for astonishingly little money.

The construction of a new 400-ft. stack and improved fume precipitating equipment at Chihuahua was instigated in part by the desire to improve health conditions at the smelter, though the metallurgical department might argue the accuracy of this statement. It has frequently been said that Mexican employees seldom can or do appreciate so-called welfare work. On this point Mr. Loeb is very emphatic: "We have not the least doubt in the world that these things are appreciated. We know that the time off for sickness is less than half what it used to be; we know that the accident rate has been lowered to a remarkable extent. Perhaps the best index is the great reduction in labor turnover. We started this work in Mexico intensively about three years ago. Much remains to be done, but progress and results to date have been gratifying."

Frequently the question has been asked: How it is that the American Smelting & Refining Company apparently gets along so well with the Mexican authorities? Regarding this Mr. Loeb is inclined to be reticent, but he remarked: "We never knowingly break a Mexican law; we never touch mining property to which the title is not perfectly sound; it is not our policy to defy or ignore public officials, no matter who they are. We may try to, and frequently do, persuade them that they are taking the wrong position. Sometimes we accept things that we feel to be unjust, but we are operating in Mexico under Mexican laws, and in the long run we have found it best to do everything in reason to keep on good terms with the Mexican people. Virtually all of our responsible officials are able to talk easily with the Mexicans in their own language and this has been a big help. Many



A street in Rosita. The industrial town is a model in every particular

disputes can be avoided if men can get together and talk matters over at the outset."

One imagines that something of the same philosophy—a reasonable amount of giving instead of all taking—that dictates the labor policy of the Smelting company applies also to its relations with Mexican officialdom. And behind both is some of the spirit of fairness, tolerance, tact, and diplomacy of William Loeb.

Chief Use of Graphite Now for Foundry Facings

NATURAL graphite is used chiefly in the manufacture of foundry facings, pigments and paints, crucibles, pencils, commutator brushes, stove polish, lubricants, retorts, and batteries, says the U. S. Bureau of Mines. During the last few years the use of graphite in the United States has undergone radical changes. Industrial applications that a few years ago consumed a large proportion of the supply are now relatively of minor importance, and uses which were unimportant have become important. Before the World War the manufacture of graphite crucibles consumed more than one-half of the supply; in 1923 only 15 per cent of the graphite used in the manufacture of finished products was devoted to the manufacture of crucibles, and in 1924 only 13 per cent.

Foundry facings used only 10 per cent of the graphite consumed in 1913; the quantity so used in 1923 was 44 per cent, and in 1924 it was 52 per cent. Other uses that were minor before the war and are now of much importance are in pigments and paints, pencils and crayons, commutator brushes, stove polish, and lubricants.

Graphite is manufactured at Niagara Falls, N. Y. This branch of the industry was started in 1897, under patents obtained by Dr. E. G. Acheson, and was developed so rapidly that after ten years the production of artificial graphite exceeded that of natural crystalline graphite. Since 1910, except for 1915 and 1920, the output of manufactured graphite has exceeded annually the combined output of domestic amorphous and crystalline graphite.

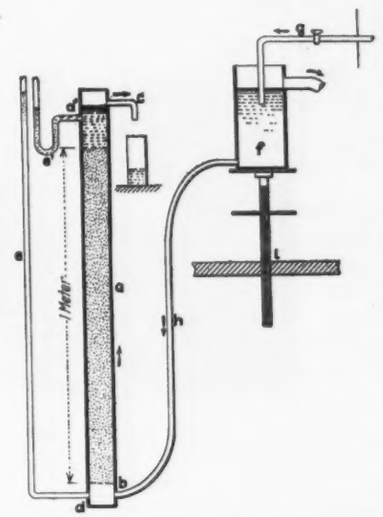
Venezuela Frames a New Mining Law

VENEZUELA is a land of large and valuable mineral deposits, but no attraction exists for foreign capital unless the country's mining laws are equitable and satisfactory. Mr. F. D. Pagliuchi has just concluded three years of strenuous campaining in Venezuela, and as a result he is able to report that for an antiquated mining law the Venezuelan government has substituted one that should greatly aid in the mineral development of that country. An article by Mr. Pagliuchi is scheduled for an early issue.

Permeability Testing Apparatus

THE permeability test described in Water Supply Paper 596-F, U. S. Geological Survey, was devised by O. E. Meinzer to measure the rate of flow of water through columns of water-bearing materials under low heads, such as are found in nature. The method is to allow inflow of water at the bottom of a column of the material of known height and outflow at the top. The difference in head of water at the bottom and the top is regulated by an adjustable supply tank and is indicated by two pressure gages. Observations are made on the rate of discharge and the temperature of the water.

The permeability apparatus shown herewith consists of a cylindrical vessel (*a*), which is called the percolation cylinder, closed at the lower end and having four openings, two at the bottom and two at the top. It is 3 in. in diameter and 48 in. high. One opening (*b*) near the bottom is for inflow of water; one near the top (*c*) for discharge of water that has percolated up through the sample; and two (*d*) and (*d'*), for pressure gages. The pressure gages consist of two glass tubes (*e*) and (*e'*), each about ½ in. diameter. They



Permeability apparatus devised to measure rate of flow of water through columns of water-bearing materials

indicate the difference in head at the bottom and top of the column of material that is being tested. The glass tubes must be large enough in diameter to avoid capillarity.

Another cylindrical copper vessel (*f*), about 12 in. high and 5 in. diameter, is used as a water-supply tank. Water from an ordinary faucet enters the supply tank slowly through a glass tube (*g*) which extends below the water level in the tank to prevent splashing. A rubber tube (*h*) leads water from the supply tank to the percolation cylinder. The surplus water is discharged from the supply tank through an opening 1½ in. diameter near the top. This overflow outlet keeps the water level in the tank nearly constant. Its accuracy as a regulator of the water level increases with the size of the outlet opening. The tank is raised or lowered by means of a screw jack (*i*), with which very fine adjustments of head are possible. Half a turn of the handle in the jack gives about 1 mm. difference in the head.

In the bottom of the percolation cylinder is arranged a circular piece of fine copper gauze. If the material to be tested is very fine, a piece of fine-mesh bolting cloth is placed on the copper gauze.

Mining Lead-Zinc-Copper Ore in the Sudbury District

The Treadwell Yukon Project at the Errington Mine

By A. H. HUBBELL
Associate Editor

EARLY in June, I had the opportunity of visiting the Errington mine of the Treadwell Yukon company, in the Sudbury district of Ontario. This was afforded through the courtesy of Joseph Errington, whom I happened to meet in Toronto. Both of us going to Sudbury that night, he introduced me the following morning to the general superintendent and the consulting metallurgist of the company. A little later in the day we met at the mine, some 18 miles west of Sudbury, beyond Chelmsford. Here a trip underground was arranged with the mine superintendent, and, later, the metallurgist explained what he was doing in the course of his efforts to work out a satisfactory method of treating the ore—not at all an easy problem for several reasons.

In the distance at the left is No. 1 shaft and the mill of the Errington mine. The bunk houses and boarding house are seen in the left center.

The ore, it might be well to explain at this point, is a mixture of lead, zinc, copper, and iron sulphides, the proportions of the first three varying so widely that it is impossible to show any relationship between the metals. The vein filling is quartz, calcite, and pyrite. Accompanying the ore in all places, moreover, is graphite.

ANOTHER SHOW FOR SUDBURY

The Errington mine is one of the added attractions of the Sudbury district, so to speak. For years "Sudbury" has meant "nickel" and nickel Sudbury, in the western hemisphere at least—this despite the copper that accompanies the nickel. The fame of the district has rested on the deposits of these metals that occur in the great eruptive sheet of norite underlying the sediments of the basin.

Sagging in the center, because of the collapse of the formations below it caused by its weight, the norite sheet is truly basin-like in shape, with its edges upturned and forming a huge ellipse where they cut the surface. A rectangle some 35 miles from east to west and 17 miles from north to south would box this ellipse very nicely. It is around and near its edge that the nickel deposits are found. Within its boundary and filling the hollow caused by the sag of the formations are sediments—namely, conglomerate, tuff, slates, and sandstones, passing from the lowest to the highest. In these sediments in the western half of the elliptical area the Errington lead-zinc-copper deposits occur, and possibly others.

MINERALIZED AREA LONG KNOWN

Although the present activity at the Errington property began just three years ago, in July, Mr. Errington has known of the existence of this mineralized area for almost three decades. About twenty-three years ago, at the time when the International Nickel Company was being organized, he was working one of the deposits in the sediments. But conditions were against him. The ores were complex, and selective flotation had not yet arrived. Besides, at the moment, nickel monopolized the attention of capital. Unable to make headway with his project, he dropped it for the moment, but did not forget it. As time went on and interest grew in complex ores of this sort, Mr. Errington gradually acquired the lands adjacent to his former holdings. Eventually the Treadwell Yukon company became the operator.

On July 10, 1925, the present manager arrived on the

The Errington flotation plant

property, and five days later drilling began under his direction. A year later to a day, sinking started, and what is now known as the No. 1 shaft was put down to the 300 level in the first twelve months. The following year a second shaft (No. 2) was started and sunk 650 ft. Recently sinking of a third shaft was begun.

How the Ore Occurs

The sulphides occur in lenticular masses in a zone about 4 miles long, roughly indicated on the surface by the irregular but generally eastward course of Whitson Creek. Apparently there are two vein systems about 1,100 ft. apart. Up to the present insufficient work has been done to acquaint the company with the extent and habit of the deposits. All indications afforded by the visible geology, exploration, and development work seem to lend assurance that the extensive property is well mineralized.

On the surface about a half dozen outcrops are visible or indicated. Near No. 1 shaft is an opening, long abandoned, sunk by one Ollier, a Frenchman, 30 years ago. In it he is reported to have cut two veins. Two or three hundred feet away is an old pit, exposing ore, and also in the same vicinity is an old heap of ore taken from an outcrop. To the west down at the river is the shaft put down by Mr. Errington in 1905, or thereabouts.

Drilling Extensive—Development

A large amount of diamond drilling has been done. In all about 88 holes have been drilled, two on every 200-ft. section (one at 45 deg. and the other at 70 deg.). In one of these ore has been shown to exist to a vertical depth of 1,100 ft.

Underground development to date exceeds 15,000 ft. No. 1 shaft is near the western end of the mineral zone; east of it 4,900 ft., and slightly to the north, is No. 2, and beyond this two miles further to the east is No. 3. Sinking of No. 1 shaft below the 300 level has recently been resumed. Most of the development thus far done centers about this shaft. Close to it is the Ollier orebody. From this and from development work the bulk of the ore thus far extracted has come. As stated on March 17 last, in the company's annual report, "the Ollier body has 1,000,000 tons of ore developed above the 300 level. Assays of all samples averaged 0.021 oz. gold and 2.15 oz. silver per ton; 1.33 per cent copper, 1.33 per cent lead, and 5.74 per cent zinc. The gross assay value of this was $13.14 per ton, but by sorting out waste and low-grade ore an enrichment of mill feed to $17 per ton was expected."

Faulting Prevalent

The workings at No. 1 and No. 2 shafts are connected by a drift on the 300 level, the former shaft being offset from this drift some 225 ft. to the south. No. 2 is similarly offset to the south about 1,100 ft. No connection will be made between Nos. 2 and 3 shafts, as they are two miles apart. At the time of my visit ore was appearing in the face of the crosscut being driven on the 500 level from No. 2 shaft N. 45 deg. W.

Considerable faulting has taken place. One fault cuts diagonally across the offset drift driven from No. 1 shaft. Another, about 1,700 ft. east of the same shaft, cuts the entire vein system.

According to the best known geologic map that has been published on the district, the three new shafts would

Mill and surface plant at No. 1 shaft of Errington mine. In the distance at the right is No. 2 shaft.

appear to have been sunk in the Chelmsford sandstone. Actually the geology is somewhat different. The error, however, is quite excusable. No. 1 shaft is in ground apparently consisting of mixed slates and tuffs. Nos. 2 and 3 are clearly in the tuff.

As matters stand, only a small portion of the property has been prospected. Mr. Bradley says that it is approximately 4 per cent. Nevertheless, sufficient ore has already been developed to warrant the construction of the 125- to 250-ton flotation plant that has been erected.

Large-Scale Operation the Goal

All this, however, is a mere preliminary in view of the company's ambitious plans. The work done to date and now in progress has but one object, and that is to determine whether sufficient ore exists to warrant a big investment and large scale operation. To get the desired information at the earliest possible moment, every effort is being made. The reader must remember that in the Treadwell Yukon group he beholds the interests responsible for the success of the Bunker Hill & Sullivan and for the remarkable achievements at Alaska Juneau. It is this that casts a glamour about the enterprise and has so quickened mining interest in the district.

The visitor is justly surprised when he hears that sinking was begun only two years ago, and yet sees how much has been accomplished. Much remains to do, however. The answer to the big question has not yet been obtained. For one thing, insufficient development work has been done to acquaint the company with the extent and habit of the ore deposits. Furthermore, only three stopes have thus far been opened, which is not enough to permit the management to decide definitely on a particular mining method. Until recently sinking has received the most attention. Until these questions are decided it is impossible to determine what it will cost to mine the ore and what the profits of the enterprise will be. This, of course, is the desired answer, and to gain it operations are being crowded to the utmost.

Zinc Market Demoralized by Overproduction in 1927

THE zinc situation at the close of 1927 was of a chaotic nature, according to a review by Jesse A. Zook that appears in the new 1927 volume of "Mineral Industry." Insufficient curtailment of the domestic industry to meet the diminishing domestic demand and decreased exportations were the factors responsible for this condition.

Production of primary slab zinc from domestic ores amounted to 611,991 tons in 1926 and 576,960 tons in 1927. Stocks of zinc increased from 13,080 to 26,937 tons during 1927. East St. Louis price declined from 7.337 to 6.241c. per pound, according to official *Engineering and Mining Journal* quotations. Concentrate prices in the Tri-State district dropped from $46 to $35 per ton between January and December of 1927. Some interesting comparisons in primary metal production by states and counties are revealed in the statistical computation accompanying Mr. Zook's review. Oklahoma's production decreased by some 16,000 tons in 1927, though Montana's output of primary metal was slightly more than in 1926, indicating that production of zinc concentrate from selective flotation plants of the intermountain West was maintained on the same level as in 1926.

Molybdenum in Vanadium or Tungsten Ores

WITH ores containing either vanadium or tungsten, the usual methods for determining molybdenum will yield high, erroneous results, unless special precautions are observed, according to the U. S. Bureau of Mines. It is evident that many assayers do not realize the necessity for precaution, even when they know interfering elements are present.

In describing the quantitative determination of molybdenum most texts present a method of limited application and either omit or append the precautions necessary to guard against certain interfering elements. For ordinary custom work it is not safe to omit the procedure for separation of vanadium and tungsten from the molybdenum, unless the two elements are known to be absent. In Information Circular 6079, by H. A. Doerner, associate chemist, is outlined a procedure selected as being the simplest reliable method for such occasional determinations as are encountered in custom analysis. For routine control work, simpler volumetric methods may be preferable.

Milling in Water Before Cyaniding

THE dissolution of gold in cyanide solution is a delicate reaction, the efficiency of which is affected by many factors. In most chemical processes it is considered essential to avoid complications that follow the contact of a metal-laden and unstable solvent with a raw material of uncertain refractoriness; but in the application of the cyanide process the hazard is not always recognized. Milling in lime water is a logical preliminary to cyanide treatment, especially now that cheap and efficient dewatering of the pulp is practicable—a step that is sometimes adopted first and repeated toward the end of treatment after milling in cyanide. The feasibility of discarding an untreated portion of the ore is also an advantage of crushing in water, this constituting the main reason for the change in this direction at the Flowery mill, in Nevada, where the total mining, milling and indirect costs now average $1.80 per ton. Mr. Jay A. Carpenter tells the story in a forthcoming issue. Is the mining and treatment of very low-grade ore economically possible? It is. Can a small daily tonnage of such ore be made to pay dividends? It can. The secret of success? The utilization of modern mining and metallurgical methods and equipment, coupled with the tempering influence of abundant common sense. The wider adoption of the technical philosophy that has guided developments at the Flowery property offers the best scope for an increase in the yield of gold in the United States.

Early Efforts in Flotation of Dry Minerals

Metal "Too Fine to Be Saved" and "Concentration Upside Down"

By Henry E. Wood
Berkeley, Calif.

MY EARLIEST flotation researches were of a pioneer nature; little had been published on the subject and even that was unknown to me. At that time I was making many concentration tests, and it was evident that the "not accounted for" item was largely attributable to the floating of fine sulphides and metallics. The first suggestion came while watching an old prospector panning gravel for gold. Much depended upon his finding "pay dirt." Carefully he panned until he heard some nuggets rattle on the bottom of the pan and dreamed of sudden wealth. They were pushed aside, washed with clean water, and an estimate was made of the gold in a cubic yard which he called a "cubit yard"—but I never corrected him. Then he panned the remainder for fine, or "flour," gold, generally associated with nuggets and often with black sand, a state of fineness caused by attrition of the softer gold with harder minerals. If an appreciable amount were present it gradually disappeared with the wash water, and in vain he tried to wet it by pushing it under the surface. With gentle vanning motions, in trying to remove the black sand concentrate, he unconsciously exposed the bottom of the pan until it was practically dry. During his close scrutiny the fine gold at the point and edges of the concentrate also dried out. Unwittingly he supplied perfect conditions to illustrate the principles of the surface tension of water. The gold floated away until an insignificant portion remained, in comparison with what he had seen. He gave it a flip, saying, "Oh, to hell with it; anyway, it's too fine to be saved." Apparently specific gravity had little opportunity to assert itself. In wet concentration I had noticed that an accidental obstruction of the water on a table, or stoppage of the supply, caused a temporary dryness and the sulphides so exposed and dried floated on a renewal of the water flow. I patented the idea of concentrating ore by this method and operated it commercially as an adjunct to reciprocating tables. My first quantitative work in flotation was in 1895, after making a large number of investigations in an endeavor to increase the floating tendency of sulphides. A wide range of oils was used; also soap emulsions, greases, agitation by mechanical shakers, compressed air and various gas-generating influences — in fact, any plan that would produce bubbles to assist the lifting of sulphides. Compared with the former methods, the results were remarkable and caused favorable comment. Previous to 1896 all my gravity-concentration tests depended upon keeping the feed immersed, but the persistent floating of the sulphides and the sinking of all gangue indicated that a separation was not wholly dependent on gravity differences. Flotation, as I applied it, was an apparent reversal of gravity, and the process was, at the time, spoken of as a "concentration upside down" *(Engineering and Mining Journal)*. The first test was made on a Boulder County, Colo., siliceous telluride ore assaying $12 per ton. By table concentration less than 25 per cent was saved in a low-grade product. The tellurides were seen floating away in a thread-like line. A flotation concentrate, collected on soap bubbles, assaying over $3,000 per ton, accounted for 66 per cent of the gold and silver, to which the table concentrate added 25 per cent more, a total recovery of 91 per cent. To meet the objections of customers not satisfied with the so-called laboratory tests, I built a large plant and adopted the slogan of "ores tested in carload lots." The works had all the modern equipment of the times. Examinations, on a commercial scale, were invariably preceded by preliminary testing of 10-lb. samples, and, if adaptable

The Educational Value of Experience

Experience is a great teacher, one is told; but profit may usually be derived from a study of the experiences of others. Mr. Henry E. Wood's intimate knowledge of the early work of the table concentration pioneers and his own experiments in the field of flotation make the account he has written on "Early Efforts in Flotation" a narrative of considerable interest and historical record

to flotation, whether arranged for or not, tests were made at my expense for information purposes, and a supplementary report was given. Oil flotation methods were attracting attention, but I decided, for the present, to confine my efforts in flotation to the surface tension of water alone, to be followed, when necessary for a higher recovery, by table concentration of the tailing. However, quite a variety of ores required only the single treatment. All small samples were prepared by customary laboratory appliances, coffee mill grinders, disk grinders, and the more common iron plate with rocking muller. One of the latter had an automatic 15-lb. muller operated by electric power. All of these appliances ground the ore too fine for satisfactory conditions, the dust refusing to be wetted, causing excess of gangue to go into the concentrates. Samples prepared in a mortar and screened demonstrated that the ore must be crushed, not ground. All tonnage lots were prepared in Krupp, Traylor, and Hardinge conical ball mills, and generally reduced to 20 mesh. Sulphides of antimony, arsenic, bismuth, copper, and lead ores often required only water flotation, whereas others needed additional table treatment to secure high recoveries.

A SUSPENDED vibrating plate dropped the dry ore, in the combination plan of treatment, on a moving sheet of water near the feed box of the table. Floating concentrates, often more than half of the total weight saved, were collected back of the head movement of the table. The gravity concentrate was collected as usual; and the tailing was rejected between the two separations just described. Dry sulphides, when fed gently, floated so readily that I designed several machines for those conditions. In one, the ore was dropped onto a moving body of water in a tank, the concentrate guided to a slight depression in the rim and thence, for dewatering, passing over a nearly vertical screen; the tailing, drawn off at the bottom, went to a Wilfley table. In a second machine the ore fell onto a revolving 6-in. roller, carpet-covered and half submerged. At the water level the gangue sank while the concentrate floated a short distance to an endless belt which picked it up for delivery to the dewatering screen.

Another form of apparatus utilized a truncated conical tank 5 ft. in diameter where a swift circular impetus was given the water with a 1-in. jet from a hose directed against the side. The tailing passed out through the vortex, while the floating concentrate was guided by a short vertical screen into a slightly depressed funnel near the water surface. Its operation was fascinating. Its capacity was one or two tons per hour, and I used it to remove minerals detrimental to cyanidation. With one ore the cyanide consumption was 52 lb. per ton; after treatment it required only 0.7 lb. per ton. It was also used for removing arsenic and bismuth sulphides from unmarketable tungsten mineral (scheelite).

LATE in 1896 I installed a plant of the Elmore vacuum oil process, a wonderfully interesting and efficient method at that time. It gave me many opportunities for comparing my results with theirs, which I embraced by checking each sample tested, principally by my combination method of treatment. The Elmore company's manager told me that they might as well quit, on account of the difference in installation costs in favor of my appliances. In July, 1907, by the admitted carelessness of one of their employees, an oil stove exploded in my laboratory, resulting in the complete destruction of the entire plant, a heavy financial loss, and nearly a year's time elapsed before a new plant could be built.

In the new mill I developed an adjunct to the Wilfley table, and under Wilfley's advice it was patented in my name. The flow of water on the table was automatically interrupted by compressed air. The feed for this machine was crushed wet with or without the presence of oil. Results were remarkable. Wilfley asked me to set the work aside until the patent was issued, at which time we would jointly operate the device upon waste dump material, and would be justified in dropping all other business. The patent was issued in 1914, when we were both too busy to enter into new interests. It was called the intermittent plan, but was never placed upon the market.

AN OBJECTIVE of mine had been to develop a small concentrating unit for prospectors' use, enabling them to realize, chiefly by their own labor and a minimum of capital invested, a net income during the early stages of their operations. At present very little is attractive in new mining enterprises save those that are on a vast scale for which capital can readily be obtained. Many a poor prospector has been poor all his life for want of a simple and inexpensive method of ore treatment by which he could get a start, instead of having to abandon what he owns, after years of discouraging struggles. Many times, in my opinion, water flotation would have met his requirements.

MANY samples were submitted to me for test in my Denver plant with the remark, "This ore simply cannot be concentrated by any gravity system." Nearly always, losses were due to surface flotation, and this was repeatedly proved. Two standard type machines of my design were installed at the El Tigre mines, in Sonora, where the high-grade silver ore, a gray copper mineral, caused losses that were almost prohibitive. After a month's run the company telegraphed a rush order for two more, adding that the two machines had saved $6,000 more than had been obtained under previous records. Shipment was promptly made, but between Bisbee and the mine, Villa raided the pack train and later destroyed the mill.

I never learned why Villa was so opposed to flotation, but his raids interfered with several installations I was making in Sonora, Chihuahua, and Durango. I was there in 1909 when the revolution started, and had to leave. A Dutch company in western Durango operated one machine with great success for just one week, when Villa burned the mill. Commercial tests on the Avino ore recovered 70 per cent of the copper by flotation alone, which caused me and some of my friends to buy stock in the company.

The engineers of the San Francisco del Oro mines, at Parral, came to Denver—five of them—from London, New York, and Chihuahua. They made an expensive and exhaustive investigation, which involved renting the mill for a month, when it was operated on a small carload shipment of their ore. As a result of the test the company installed twelve standard machines and arranged for eighteen more to be built at the mine. A brief letter informed me that the machines did the work expected of them, but those responsible for their operation never gave me a detailed statement of their performance. Villa interfered here also. From reliable

private sources I learned that the machines were operated until three or four years ago. *The Mining and Scientific Press* at that time complimented me on the successful solution of a milling problem for the largest known body of a complex ore, one that had previously defied all efforts.

Every mine of the Anaconda Copper Mining Company was sampled and the ores were tested. One test upon ore from the Gagnon is as follows:

	Silver, Oz.	Copper, Per Cent	Per Cent Recovery Silver	Copper
Feed, 30 mesh	4.80	2.90		
Flotation concentrate	32.80	17.97	27.11	24.59
Wilfley concentrate	12.30	7.96	60.11	64.40
Total concentrate			87.22	88.99
Tailings	0.32	0.35		

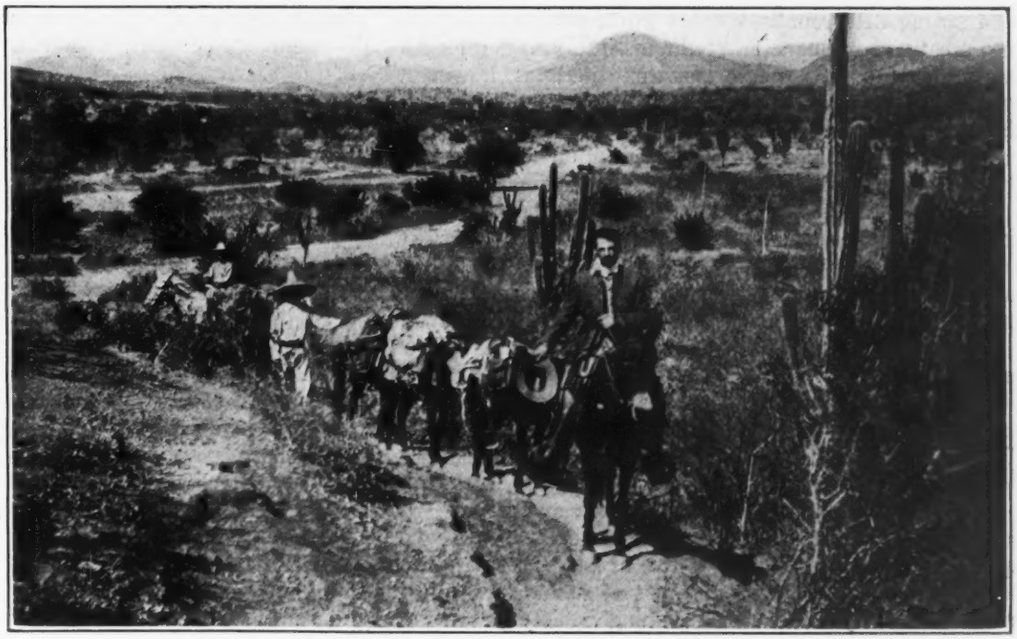
The manager personally confirmed the tests and telegraphed his company that I had solved the treatment problem for their fines and that he would finance the method himself if the company would not. A detailed report gave the same conclusions. He was confident that the method could be applied to the vast accumulations of "sludge" which the company was holding. However, I pointed out to him that partial oxidation would prevent the successful treatment of the sludge. A later trial upon 1,200 lb. confirmed this conclusion as there was no appreciable change in its composition before and after treatment. The process is applicable only to freshly mined ore, and if the ore is mined wet the most careful artificial drying is necessary to prevent a slight oxidation of sulphides which checks their floating tendency. Thus ended some of my earliest efforts in flotation, using simple surface tension to float dry mineral particles.

Part of the Denver plant was kept busy as a custom mill, chiefly on molybdenite ores for which there was a limited demand, but concentration difficulties prevented development of such mines, and concerns wanting molybdenum were not satisfied that deliveries could be relied upon. I spent two months visiting every molybdenite property known, from Mexico to Alaska. Owners of such ores gladly accepted my offer of 25c. per pound and freight, for molybdenum sulphide contents. My first contract was with the General Electric Company for 130,000 lb. at $1 per pound for a 90-per cent molybdenum sulphide product free from copper. Shipments averaged from 91 to 93 per cent and recoveries, 93 per cent. Higher-grade tonnage lots of from 93 to one of 97 per cent were shipped to Germany, France, and England. One foreign mine shipped in over 500 tons of 5 per cent ore from a surface outcrop, for which I remitted to it over $50,000, which sum paid for the mine and built a 50-ton mill.

It should be recalled that in this almost pre-Rip Van Winkle period but few gravity systems were saving over 75 per cent in their milling operations, so great interest was manifested in the new method, one which, after personal investigation, was strongly endorsed by scores of the best-known metallurgical engineers. Later on this was followed by a reaction, partly because of the objectionable features of dry crushing and the partial oxidation of ores that were mined wet and had to be dried. Gradually interest in the process disappeared through the introduction of oil flotation by a most powerful organization. The ore could thereby be crushed wet, and with the aid of present-day marvelous selective reagents almost any complex ore separation is possible.

Fuller's Earth as a Filter Aid

FULLER'S EARTH is used mainly as a filtering medium in clarifying or bleaching fats, greases, and mineral and vegetable oils, according to the U. S. Bureau of Mines. Its original use was in fulling woolen cloth, and from that it derived its name, but this use, at least in this country, has almost been abandoned. Fuller's earth is also said to be used in the manufacture of pigments for printing wall paper, in detecting certain coloring matters in some food products, as a substitute for talcum powder, and in medicine as a poultice and as an antidote for alkaloid poisons. Another suggested use is in deliming hides in the manufacture of leather. It has been stated that the fuller's earth cake from oil mills can be used in the manufacture of hand soaps, concrete waterproofing, and asphalt preparations.



A mining engineer on the trail in Mexico, with mozos and pack mules

Chilean Government Pioneers in Providing Financial Aid to Mining Industry

Mining Bank, With Capital of One Million Sterling, to Encourage Domestic Developments

By F. BENITEZ

Compania Minera "Disputada de Las Condes," Santiago, Chile

BY THE enactment of Chilean Law No. 4,112, dated Jan. 12, 1927, the Chilean government created a mining bank under the name of "Caja de Crédito Minero." The idea underlying the project is not new, but this law is, to the best of my knowledge, the very first to be put into operation with the backing of a government, and will give an excellent opportunity of seeing whether the plan will work in practice. Until now, the governments of all mining countries have left the carrying out of industrial mining enterprises to individuals, corporations, or companies, helping certain metal-mining industries by means of protective tariffs, as exemplified by the duties on lead and manganese in the United States, or by arrangements such as the Pittman Act to stabilize the domestic silver industry after the World War.

That this policy of leaving the mining industries to shift for themselves should have been until now so closely adhered to by the governments of all mining countries is well understood by the mining fraternity. There is no question that the great difficulty that besets the true appraisal of a mine's possibilities and the tremendous risks run by practically every mining venture have acted as a strong deterrent in keeping governments from aiding, creating, or financing credit institutions such as the one under review. In the last three decades, however, great strides have been made by mining engineers in thoroughly proving ore reserves. Improved metallurgy has done the rest, so that the gold mines of the Rand and the low-grade copper porphyries in both the Americas, to cite two well-known examples, have become safe industrial enterprises. In such mines as these, the risks are reduced to a minimum at the beginning by brains and capital working together, so that they may truly be called industrial enterprises, rather than mining ventures.

The principal provisions of the new Chilean mining law are as follows:

The mining bank can grant loans only to mining enterprises in which 75 per cent of the capital is held by Chilean citizens or by foreigners with five years' residence in the country.

The bank will be administered by a council or board composed of eight councilors, of whom two shall be appointed by the president of the republic; two by the president also, selected from a list of five persons submitted to him by the National Mining Society (Sociedad Nacional de Minería), two by the senate and two by the house of representatives (chamber of deputies). The president of the bank, who is its executive head, will be nominated by the president of the republic from a list submitted to him by the council. The president of the bank and the councilors will be remunerated for their services.

Article 7 establishes that the president, the councilors, the attorney, and the technical staff of the bank will be held responsible before the law with their persons and private property for any unlawful transactions.

Article 11 fixes the capital for the bank at $40,000,000 Chilean currency (£1,000,000), and the bank is authorized to issue bonds, with the state's guarantee, for that sum, at an interest of 7 per cent per annum, with cumulative amortization of 1 per cent per year.

The object of the mining bank shall be to foster the establishment of treatment plants by means of money loans when the proved ore reserves are favorable. The bank will grant loans only for constructing plants that shall use metallurgical processes or machinery already industrially proved or that have had commercial success in analogous instances. In no circumstance shall the bank grant loans for installing systems of beneficiation where a commercial product is not made, nor for the use of machinery recently invented, nor for the exploitation of mines.

Article 15 states that the bank may grant, as an exception, individual loans up to the sum of $3,000,000 Chilean currency, for any of the following purposes:

1. For building smelters.
2. For building sulphuric acid plants annexed to smelting plants.
3. To improve or enlarge existing plants.
4. To furnish capital for treatment plants already working. Special guarantees are required from such plants.

Article 16 establishes that no loans (except as in the aforesaid paragraph) shall be greater than $1,500,000 Chilean currency. To grant a loan, the owner or company soliciting one must show that the mining property has sufficient proved ore reserves, both in regard to tonnage and grade, so that the net earnings of the enterprise, considered as a whole, will permit the total amortization of the loan in a maximum period of twelve years. The preliminary technical report proving these requisites

must be signed by a mining engineer whose qualifications have been accepted by the bank.

Article 19 establishes that all legal titles to the mining property must be reviewed and approved by the bank's attorney before the granting of any loan. Also, before the loan is finally granted, the bank will have the mine examined and reported on by one or more mining engineers in the confidence of the bank, who shall make a thorough examination of the property and of the metallurgical process proposed. According to the tenor of this final report, the bank will decide whether or not to grant the loan asked for. The expenses incurred during all examinations and reports shall be defrayed by the owner or owners of the property.

An engineer of the bank shall control the construction of the plant, which shall be built according to the plans approved by the technical staff of the institution and passed by the council. Before the bank shall proceed to buy the machinery for the plant, the owner of the property must deposit a guarantee proving that he possesses the required capital to begin operations. The bank shall fix the amount and the conditions of this guarantee, which later may be decreased.

The interested party must grant the bank a first mortgage on the mining property so as to guarantee the value of the loan, interests, costs, and commissions. He must also grant the guarantee that the bank may demand. The mines which will constitute the mortgage as a guarantee against loans made by the bank will be subject to embargo contrary to the clause established in the mining code. As a consequence, those mines and all their buildings, utensils, tools, and appurtenances may be sold at public auction for payment of debts to the bank.

Any mortgage made in favor of the bank will give to it preferred payment before all creditors excepting employees and workingmen for the total of their salaries and wages.

The bank reserves to itself the right to superintend and to intervene in the exploitation of the mine and plant given as a guarantee, and also with respect to the accounting.

The bank will have the right to the profits derived from its own operations and also the right to demand a payment of 2 per cent per annum as a commission on the total sum of each loan made.

Debtors must pay interest on their loans at a rate at least equal to the interest that the bank pays for the bonds it issues. These two clauses together will really amount to an interest rate of 10 per cent per annum on all loans made: 2 per cent commission, 7 per cent bond interest, and 1 per cent amortization.

Loans will be amortized by means of half-yearly payments calculated so as to cancel the whole of the debt in a maximum period of twelve years reckoned from the date the contract is signed.

If there be delay in the payment of a debt, the debtor will pay a penal interest of 1½ per cent per month on the lapsed payments. A lapsed payment of six months will give the bank the right to start legal proceedings to demand the payment of the whole of the unpaid sum, and a delay of three half-years compels the bank to begin such an action.

The debtors are compelled to set aside a minimum of 10 per cent of their liquid profits to form a reserve fund until this fund reaches 25 per cent of the total loan made; but under no conditions will this guarantee exceed 50 per cent of the unpaid balance of the loan. This fund will be deposited with the bank and will earn an interest of 6 per cent per annum. The debtor will be able to draw on this fund only to meet expenses created by the making of extraordinary repairs and in other perfectly justified circumstances, and always with the approval of the council.

Any debtor of the bank who may wish to cancel or make extraordinary amortizations of his loan may do so. If a company wishes to increase its capital in order to make such an operation, it must have the approval of the council before soliciting the necessary authorization from the president of the republic to increase its capital.

All persons and companies who have received a loan will continue to be personally responsible until such a loan be totally canceled, notwithstanding their having transferred their rights to the mortgaged property.

The bank shall have its bonded obligations referred to in Article 11 guaranteed by the state, and the mining bank will be under the control of the superintendent of banks. All income of the bank is exempt from the payment of duties.

The mining bank is authorized to buy and sell on its own account or on a commission basis, ores of gold, silver, copper, lead, zinc, manganese, and sulphur, their concentrates, and the metallurgical products obtained by beneficiating the same by any process. It will also be able to buy and sell other ores provided a majority of the council should decide to do so. However, the bank cannot invest more than $4,000,000 Chilean currency in the operations authorized by the two previous sentences. The council of the bank will fix the tariffs whereby the buying and selling of the ores mentioned shall be carried out.

As will be seen, the law is well thought out, specially if it is considered that the commission that drafted it had no such similar legislation from other countries to draw upon. The previous law, No. 4,112, was amended by a later one, No. 4,302, dated Feb. 9, 1928. The principal amendments consisted in making the duties of councilors remunerable; which is a just provision, since the work that will fall on them is bound to be heavy and the responsibilities even heavier. Another wise change consisted in augmenting the credits to $3,000,000 in those instances referred to in Article 15; as $1,500,000 was much too small a sum for clauses 1, 3 and 4, cited in Article 15. However, I must make a strong exception in the case of clause 2, that of loaning $3,000,000 for building a sulphuric acid plant annexed to a smelter, since there is no market for sulphuric acid in Chile. The most important change introduced by the amendment consisted in making the bank, by means of three special clauses, 45 to 47 inclusive, a buyer and seller of ores and their metallurgical products.

For many years there had been in Chile much dissatisfaction among the miners with the prices for ores offered by the buying houses established in Chile, which, according to the miners, had organized a kind of ring to keep the prices down to a minimum. This dissatisfaction often culminated in indefinite demands made to the government from time to time that it should take some action to protect the interests of the small miner, who in Chile, as elsewhere, is generally poor. The opinion most generally heard was that the government should finance or help in some form one or two of the old smelters which, through adverse conditions, and specially the impoverishment of the mines that formerly fed them, were compelled to shut down, like Guayacan,

at the port of Coquimbo, and Caldera, at the port of the same name in Atacama. The help, according to current belief, would have come in the form of the government fixing reasonable prices for the ores bought by those smelters to which the government would give financial assistance. Others even clamored for government-owned smelters, run more or less for the benefit of the miner, where he would get good prices for his ores and the government would make up the loss.

Now, at last, help has come in the form of an authorization from Congress to the mining bank to buy the miner's ores. The job will not be an easy one for the bank, because, besides the usual difficulties that confront this very special trade, the great majority of Chilean miners cannot and will not work their mines unless money advances are made on ore which, more often than not, has not even been explored for, much less blocked out in the mines.

I think it is only just to mention that the credit for the establishment of the "Caja de Crédito Minero" in Chile is due in the first place to the great enterprise, untiring energy, and unbounded enthusiasm and faith of Señor Osvaldo Martínez C., secretary for many years of the National Mining Society, whom the president of the republic, Señor Carlos Ibañez del Campo, very justly nominated president of the bank.

The mining bank is the third of three similar credit institutions, the others being an agricultural and an industrial bank, created by the present government with the object of fostering the three mainstays of the economic life of the republic. With regard to salitre, the foremost of Chilean industries, the able minister of finance, Señor Pablo Ramirez, has just announced the promise of the government to render material financial aid to the industry in its successful struggle against synthetic products for supremacy in the world's fertilizer markets.

Increased Uses for Selenium and Tellurium

THE use of selenium organic compounds in the manufacture of rubber articles is gradually increasing, states S. Skowronski in *Mineral Industry* (McGraw-Hill Book Company). It is being used in a wide variety of articles such as rubber heels, soles, tire treads, brake lining, inner tubes, bumpers, and what is known as carcass sticks, that is, the sheet of rubber between plies of fabric in belting and tires. It is expected that within a year of two the use of selenium organic compounds in rubber will develop quite extensively. "Vandex," a selenium organic compound, is described in the *India Rubber World*.[1] Results of tests given show that the use of "Vandex" increased the resistance to abrasion of the resulting cured rubber from 25 to 30 per cent in one compound and from 50 to 90 per cent in another compound. The use of selenium in rubber used for the covering of cable is now well established and large quantities of such cable are now being sold, with reports of its successful use.

By the use of the Taylor process, selenium and tellurium wires of as small a diameter as 1 millimeter to 1 micron may be drawn[2] and the fine-drawn wire is finding some commercial applications.

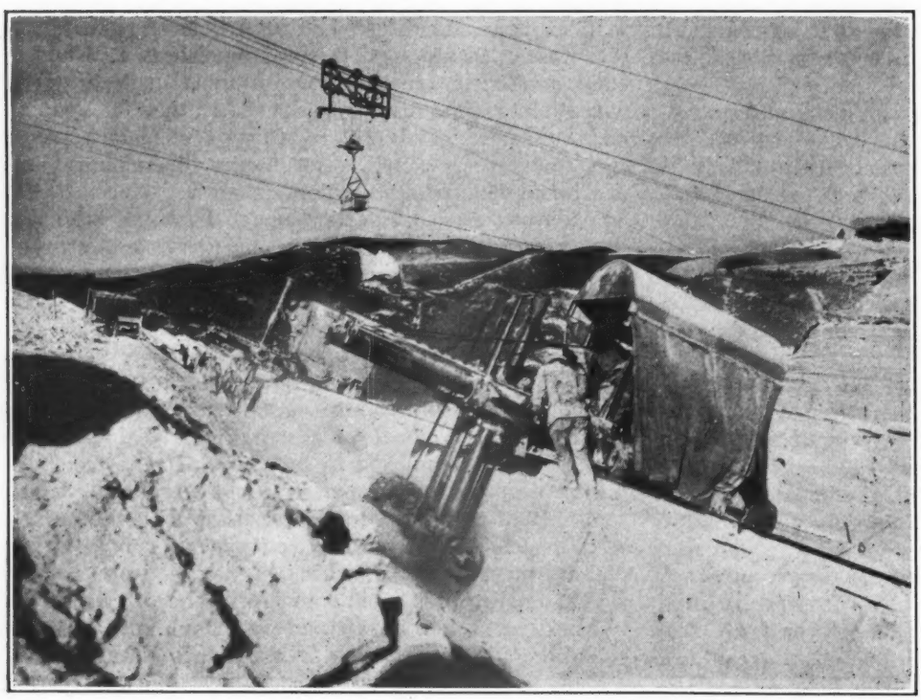
Patents have been applied for on the use of copper telluride and metallic tellurium in dry rectifiers. Tests have shown that tellurium is more satisfactory for this purpose than copper oxide.

The literature for the year shows that considerable experimental work is in progress in the use of selenium and tellurium in the manufacture of medicinal preparations.

[1]Vol. 76, 136 (1927).

[2]"Fine Wires," a booklet issued by Baker & Company, Inc., Newark, N. J.

An Unusual Method of Mining

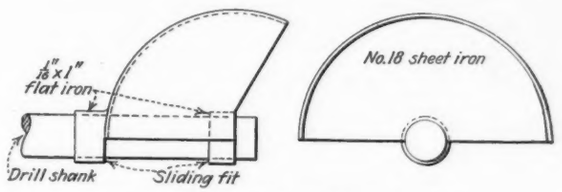


Mining by power saw — the initial step in the manufacture of insulating brick at the plant of the Celite Company, at Lompoc, California. The raw material is an exceptionally high-grade diatomaceous silica.

USEFUL OPERATING IDEAS

Guard for Chipping Hammer Minimizes Hazard

A SERVICEABLE guard for a chipping hammer, writes R. M. Thomas, of Denver, is shown in the illustration. It is constructed of No. 18 gage iron, with two bands to fit the shank of the chisel or drill. The bands are of $\frac{1}{16}$x1-in. band iron, which should be a sliding fit on the drill shank. When the operator desires to chip rivets, steel, and the like, he should slide the guard



A guard for protecting operator of chipping hammer

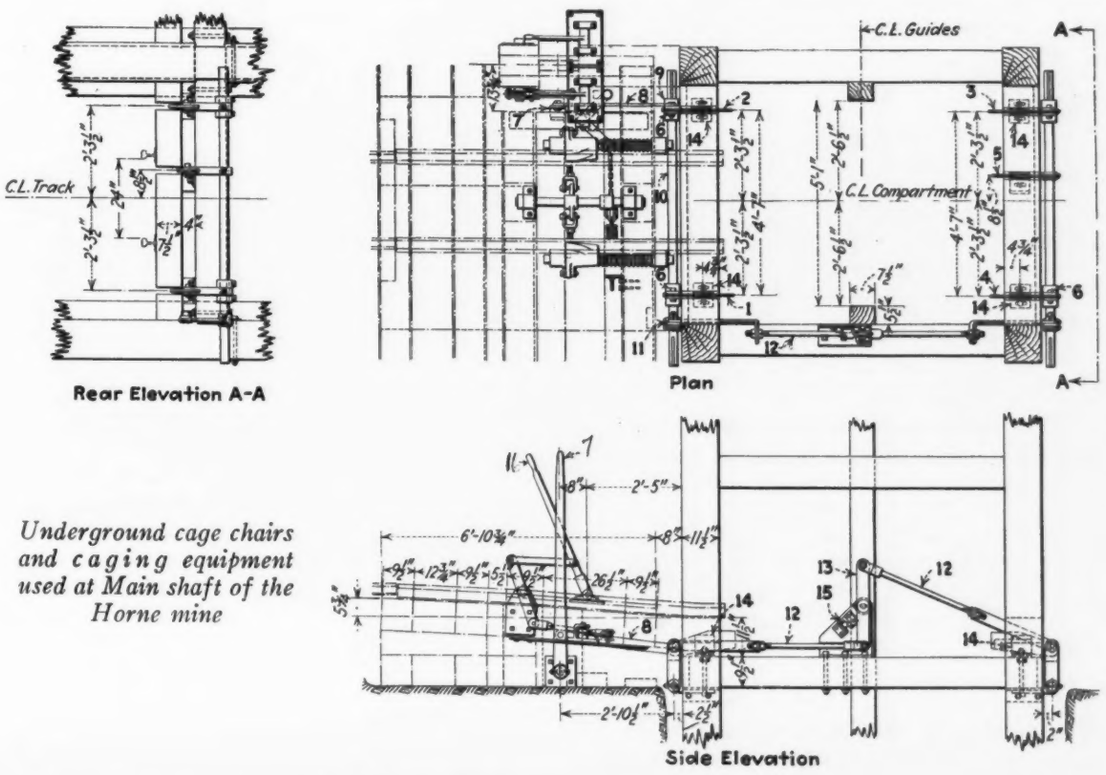
down the shank against the work, keeping its top on the side on which the chips will fly. This may seem cumbersome at first, but when the operator gets accustomed to it he will be able to slide the guard in place with one hand, at the same time holding the chipping chisel in place and operating the hammer with the other hand. The guard will protect the operator, avoid injury to the other workmen near him, and prevent breaking of windows. It is designed so that the operator can always see the point of the chisel.

Underground Cage Chairs and Car Caging Equipment

THE accompanying drawing shows the underground cage chairs and car-caging equipment used by the Horne Copper Corporation, Noranda, Que., at its Main, or No. 3, shaft. This cage chair is of the four-stop adjustable contact type, the stops being hinged at end of levers (see illustration) to make them foolproof should they be pushed in when the cage is ascending. Stop 5 is for operating the Nolan semi-automatic caging equipment, which opens the horn buffers on the cage, when the latter comes to rest on the chair stops 1 to 4.

The chair is operated by lever 7, which is connected with a bar 8 to lever 9. The motion is then transmitted through shaft 10 to lever 11, which in turn is connected to the opposite side by the adjustable rods 12 and the reversing lever 13. Steel wedges riveted to base plates 14 (1 in. thick), in which are slots, allow for adjusting the four-chair stops level with the underside of the cage. Stop 15 on the bracket is for the chair in the out position. Lever 16 is for releasing the horn buffers in front of the loaded ore car entering the cage.

The operations are as follows: The chair stops are



Underground cage chairs and caging equipment used at Main shaft of the Horne mine

pushed into position by lever 7. The cage, in coming to rest, opens the horn stops mounted on it by means of a lever connected to them, which is on its under side, this on coming in contact with stop 5. Lever 16 is then pushed forward, which opens the buffer stops in front of the loaded car and allows the car to run down the short incline and gather enough force to bump the empty car off the cage. The loaded car, on entering the cage, opens out two keepers or back-wheel stops, which, in turn, allow the lever resting on stop 5 by that movement to be pulled forward, drop down, and resume its former position on the under side of stop 5. This causes the horn buffers to spring into position in front of the oncoming car, and when the front wheels of the car touch them, the keepers close in behind the back wheels and lock the car in position on the cage. The signal is then given for the cage to ascend, and as stop 5 is also hinged, the cage buffer lever only raises it a few inches and lets it drop back into place.

Lubricating Device for Sintering Machines

LUBRICATION of the sliding surface of the pallet frame of the Dwight-Lloyd sintering machine as it passes over the guide castings, dead-plate castings, and the wearing strips on top of the coping castings of the wind box is usually accomplished by compression grease cups, or similar devices, placed at intervals along the coping castings, writes Edward Cuddihy, master mechanic at the Tooele smelter in Utah. These cups are not easily accessible, and neglect, dust, and temperature combine to make them inoperative. Undue wear on the pallet frame and on the wearing strips results, necessitating frequent renewal of these parts, with consequent delay and expense.

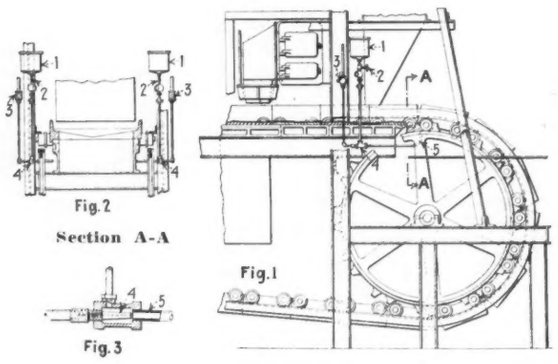


Fig. 1—Side elevation of drive end of sintering machine, showing lubrication device in place. Fig. 2—Cross-section along AA in Fig. 1. Fig. 3—Injection element of the device.

A compressed-air device providing efficient lubrication of the sliding surface and wearing strips, besides creating an almost gas-tight contact and thereby minimizing leaks that cause the sinter fans to be inefficient, has been developed at the Tooele smelter of the International Smelting Company. The general details of the device are shown in the accompanying sketches.

Fig. 1 is a side elevation of the drive end of a Dwight-Lloyd machine, showing the lubrication device in place. Fig. 2 is a cross-section view at *AA* in Fig. 1. Fig. 3 shows the injection element of the device. In operation, the reservoir 1 is filled with lubricant, and the valve 2 is so regulated that a drip feed of oil is maintained. The valve 3 in the air line is then regulated, and as the air passes through the injector nozzle 4 it picks up the lubricant and carries it through the pipe 5, spraying it on the wearing surface. This is a continuous operation, and is directly under the inspection of the machine operator stationed on the floor, who can change the oil feed at will. Application has been made for a patent.

Tailing Sampler Operates Without Loss of Head

RECENTLY I was confronted with the problem of installing a sample cutter at a definite point in a tailing launder with the least loss of head, writes C. W. Tandy, of Winnipeg, Canada. Ordinarily the problem would have been solved as illustrated by Fig. 1 with

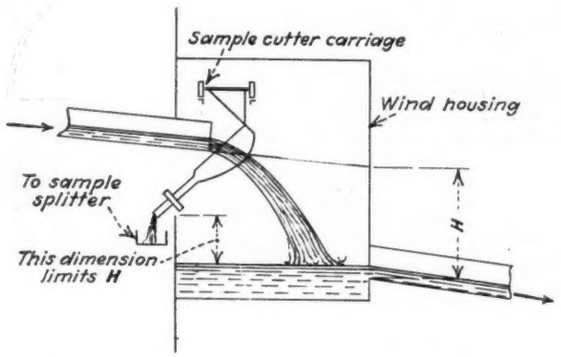
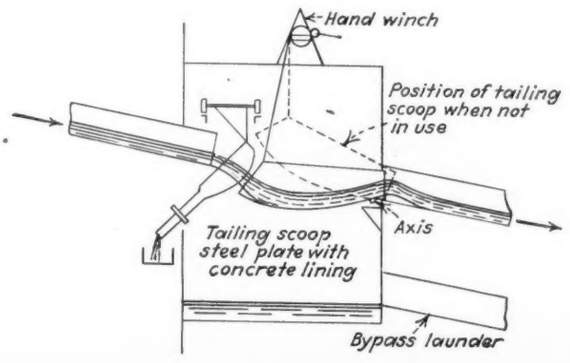


Fig. 1—A typical sample cutter installation

the loss of head *H;* but by taking advantage of the stream velocity with a device called a "tailing scoop," as illustrated by Fig. 2, the sample cutter could cross the launder with no loss of head. In fact, a small head was actually gained.

In the particular installation the device saved the cost of lowering the launder beyond the sampler, not to mention the tailing-pond volume kept available by the ability to raise the tailing dike to the bottom of the existing launder. It helped to solve a tailing-disposal problem when it was essential that the mill be operated at maximum capacity.

Fig. 2—Sample cutter with tailing scoop


Hand winch
Position of tailing scoop when not in use
Axis
Tailing scoop steel plate with concrete lining
Bypass launder

Personal Notes

FRANK L. SIZER, mining engineer, of San Francisco, has returned from a professional trip to Arizona.

DR. ALEXIS FINKELSTEIN, of Aron Hirsh & Sohn, Berlin, Germany, is in the Salt Lake district on professional business.

C. Y. GARBER, assistant mill superintendent of Bunker Hill & Sullivan, has been elected a member of the board of directors of Bobby Anderson Mining.

HARRY M. LANCASTER, mining engineer, and manager of the Little Sunshine Mining Company, a Cœur d'Alene property, is making a visit to New York.

CHARLES SPEARMAN, consulting mining engineer, of Montreal, has gone to Cuba on a business trip. He is expected to return about Nov. 1.

ROY H. ELLIOTT, mining engineer, of San Francisco, has returned from Peru, to which country he had gone on professional business.

S. E. STEIN, of Southwestern Engineering, has returned to New York after a stay of two and a half months in the mining districts of Quebec and Ontario.

SCOTT TURNER, Director of the U. S. Bureau of Mines, has been elected president of the University of Michigan Alumni Club of Washington.

SAMUEL RICHARDSON, mining engineer, has been appointed assistant manager of Jack Waite Consolidated, situated in the Coeur d'Alene district.

THOMAS VARLEY, consulting metallurgical engineer, of Salt Lake City, has returned to his headquarters there from a business trip of ten days to St. Louis.

C. C. CARHART, consulting mining and metallurgical engineer, Salt Lake City, is conducting several classes a week in the department of mining and metallurgy of the University of Utah.

JOSEPH CLENDENIN, sales manager of Guggenheim Brothers, and vice-president of Copper Exporters, Inc., sailed from New York on the "Majestic" on Oct. 5 for a short vacation abroad.

HOMAR L. JOHNSON, assistant editor of *Engineering and Mining Journal*, returned to New York on Oct. 3 after a trip through the Michigan copper country.

H. HART PRATLEY, Utah mining engineer, has been spending some time in Colorado engaged in original work in earth measurements by geophysical methods.

WALTER A. RUKEYSER is at present engaged in the construction of an asbestos milling plant near Globe, Ariz. He expects to remain there about four months.

KIRBY THOMAS, mining engineer of New York City and president of Florence Goldfield Mining, was in Goldfield for several days, recently, inspecting the company's properties.

A. W. FAHRENWALD, since 1919 metallurgist and ore dressing engineer of the U. S. Bureau of Mines, has been appointed professor of metallurgy at the University of Idaho School of Mines. This appointment becomes effective as soon as the projects which Mr. Fahrenwald has under way at the Bureau can be completed or adjusted, according to an announcement by Frederick J. Kelly, president of the university. At present Mr. Fahrenwald is dividing his time between the stations at Moscow, Idaho, and Houghton, Mich. His professorship at Idaho will provide him ample opportunity to continue research projects and to maintain his contacts with the mining interests of the state. Results of Mr. Fahrenwald's studies of complex ore problems in the Coeur d'Alene district have been significant factors in improving milling practices in the region. Mr. Fahrenwald also studied ore dressing of copper ores, with special attention to problems in Michigan districts. His laboratory studies indicated that flotation should supplant the customary procedure of table concentration. As a result of the discovery, Michigan copper companies are expected to save from 2 to 4 lb. more copper per ton of ore milled. Mr. Fahrenwald received his bachelor of metallurgy and metallurgical engineer degrees from the South Dakota School of Mines. His degree of engineer of mines was received from the New Mexico School of Mines. He spent five years teaching, mostly at the New Mexico school and the Texas School of Mines.

A. W. FAHRENWALD

HAMILTON M. BRUSH, vice-president and sales manager of American Smelting & Refining, returned to New York on Oct. 3 from London, where he participated in the international conference of lead producers.

J. F. CALLBREATH, secretary, and GEORGE H. BAILEY, counsel, of the American Mining Congress, have returned to the Washington headquarters of the organization after an extensive trip through the West.

J. M. CALLOW, president and general manager, General Engineering Company, New York City, has returned to London, England, from a visit of two weeks to the property of the Rio Tinto Company, Ltd., Rio Tinto, Spain.

R. F. MCELVENNY, manager western department, American Smelting & Refining, has returned to his Salt Lake City headquarters from an inspection trip to the El Paso, Chihuahua, and Monterey plants of the company.

JULIUS HALL, mining engineer, of Wallace, Idaho, is in charge of operations at Evolution Mining. CONRAD WOLFLE recently resigned as vice-president and manager of this company, which owns properties in the Coeur d'Alene district.

GEORGE H. RYAN, Utah mining engineer and member of the Utah Legislature, has resigned his position as superintendent of the North Beck and Sacramento properties in the Tintic district. Mr. Ryan will devote his time to private operations in that district.

JAY P. GRAVES, of Spokane and Pasadena, founder of Granby Consolidated Mining & Smelting, and L. A. FRIEDMAN, state senator and mining operator of Nevada, recently visited Toronto. Mr. Graves was in Canada on business in connection with a mining concession in Quebec.

Dr. K. GLINZ, of the Technische Hochschule, Berlin, Germany, who is studying flotation practice in this country, and Doctor GRUMBRECHT, president, School of Mines, Klausthal, Germany, who is studying mining methods and metallurgical practice in this country, recently visited the Intermountain Station of the U. S. Bureau of Mines, Salt Lake City.

OBITUARY

WILLIAM FIELD WARD, mining engineer, died on Sept. 20 at his home, 910 Monroe St., Denver, Colo. He was born in Howard County, Mo., on May 10, 1879, and graduated from the Colorado School of Mines in 1903. He worked for a number of years for Conrey Placer Mining, at Ruby, Mont. Since 1910 his work had been confined to placer mining in South America, and for the last seven years he had been employed by the Pacific Metals Corporation, of New York, in platinum dredge mining near Buenaventura, Colombia. He designed a hand drill for testing placer ground which has been successfully operated for a number of years.

COMMENT AND CRITICISM

Biographies for Inspiration and Information

Mr. Adolph S. Ochs Finances Biographical Dictionary in Which Mining Engineers Will Be Well Represented

THE EDITOR:

Sir—Recently I have been preparing a number of biographies of engineers for the "Dictionary of American Biography." This is to be a sort of encyclopedia of some twenty volumes containing biographical articles on all Americans who have led important or significant lives. No living persons will be included, and it is not one of those schemes by which mediocrities can be boosted into fame by payments made by their family or friends. The money to finance the dictionary has been given by the owner of the New York *Times* for the patriotic purpose of supplying the nation with an adequate and unprejudiced reference of its interesting personalities. It will resemble the well-known "Dictionary of National Biography" of the British people. Such a reference has, of course, been needed for a long time.

In contrast with the policy of some other biographical collections, the emphasis will not be placed mainly on politicians, soldiers, and clergymen, in compiling the lists of names to be included, but scientists, engineers, artists, writers, and leaders in industry will be given due appreciation. All individuals who have occupied official positions will not be included unless their own influence or accomplishments warrant it, that is, the emphasis will be on the man rather than on the title. This policy has been responsible for deleting from the list a number of pompous persons who were thought to be of great distinction in their day, but are now seen to have been absurdly over-praised; the list has been reduced by several thousand of these. I know of one mining engineer who was thus ruled out, but will not mention him.

Mining engineers rank well in the lists of names to be included. In the early period of American mining many outstanding personalities had definite influence on the development of the country, perhaps more than will be the case during an equal period in the future as specialization becomes more and more extreme. American mining engineers were preceded only by the civil engineers in becoming nationally organized, and were, for long, men of broader interests and greater adaptability than civil, mechanical, or electrical engineers. Many of them were educated abroad, where they acquired a sophisticated and mature point of view, and they raised the standards in this country for the engineering profession in general. Along with their skill in technique they early developed an interest in economics, and, sometimes, an ability in the administration of mining communities, which means that they were men of the world with an understanding of human nature.

Generally speaking, the biographical material available on mining engineers is fuller and more satisfactory than that on other engineers. This is because the editors of mining publications have been broad-minded and sympathetic enough to be interested in such matters. Editors like Rossiter Raymond, T. A. Rickard, H. Foster Bain, and W. R. Ingalls gave much time and attention to evaluating their contemporaries. Dr. Raymond took more care with an obituary article on a colleague than the ordinary engineer takes in preparing a technical paper, and Mr. Rickard's famous interviews with mining engineers set a standard for other editors to emulate. This is an excellent thing for the profession, and as time goes on the pioneer work of these capable editors will be more fully appreciated. Another factor making for human interest and the amenities was the presence of engineers who had been fortunate financially and who devoted part of their money to the improvement of their profession; thus James Douglas made many generous personal gifts besides a large one to the Engineering Societies Library, and R. P. Rothwell published *The Mineral Industry* for years at a financial loss. Other mining engineers, like Louis Janin, Hamilton Smith, Hennen Jennings, and H. V. Winchell, were public-spirited in the sense of helping promising youths and unconsciously showing them how men of the world conducted themselves. All these factors tended to elevate the engineering profession and to give engineers a standing in the community which more timid or less generous ones have not always maintained.

I was surprised to find how much the nation owes to the anthracite engineers. Rothwell, of course, was from the coal region, although originally from Canada; he joined with Dr. Douglas in advocating publicity for technical improvement—an exceedingly important change in American engineering policy. An anthracite operator who was an example for others was Eckley B. Coxe, one of the founders of the Institute at the historic Wilkes-Barre meeting, and the inventor, among other devices, of the steel tape to replace the surveyor's chain. Coxe was a man of distinguished and wealthy family, but unselfish to a fault; he belonged to the patriarchal, landed class. Perhaps the Institute owes its founding to the anthracite engineers; Dr. Raymond, who was consulting engineer for many coal and iron enterprises, was inclined to give Rothwell the credit for conceiving the organization. The agency of the *Engineering and Mining Journal* was also a decisive factor in giving publicity and headquarters at a formative time. Dr. Raymond turned over his ownership of the *Journal* to Rothwell after losing money on it, although he remained one of the editors for many years.

It is always rather difficult, in writing a biography, to obtain a comprehensive understanding of the personality of the man. Many records of lives merely state dates and facts in a way to discourage the reader. Even the relatives who knew a man best often show lack of imagination or of trust in human nature in supplying material for his biography. I have found that sons and daughters are apt to be snobbish in wishing to suppress the fact that their father had any hard times as a young man, even though the father himself had no snobbishness in his nature. Many families apparently wish biographies to include only those facts that will react to the social enhancement of themselves. Others are unable to see that temporary honors which their father or grandfather received, such as a letter from a Congressman or the chairmanship of a committee to entertain visiting firemen, are less interesting to readers of a reference work than sidelights on the difficulties which he encountered in getting his start in life. A good biography should describe as many as possible of the mistakes of the young man and should show that his life was not a triumphant progress, with people recognizing from the start that here was an exceptional individual who was going to succeed brilliantly. Otherwise the biography will read like the story of a demigod, and the reader will get the

idea that such a grand figure belonged to a race apart.

For example, I found it extremely interesting, in writing on Cyrus W. Field, who laid the first Atlantic cable, to note the stupendous hardships which befell him. Before he finally succeeded in laying a cable that did not get out of commission, nearly everything happened to hamper and discourage him that could possibly do so, from the burning of his warehouse to the repeated breaking of the cable. One month the public called him a fool, the next he was "gallant and glorious Cyrus," and next he was accused of being a swindler and crook. In writing of a man like H. C. Frick, the partner of Carnegie, I found that it lent a human touch to reveal that all his life he suffered from violent attacks of indigestion; this infirmity, however, did not keep him from recognizing the merits of Henry Oliver's scheme for buying up the Lake Superior iron-ore lands at a time when Carnegie shook his head and said that such "pioneering" did not pay. Frick helped make possible the Oliver Iron Mining Company, and in several other arguments with Carnegie had the better side.

It is of interest to know that James Douglas was at one time manager of an insane asylum in Quebec, and that he was attracted into mining, after having tried several other occupations, by a somewhat unfortunate investment of his father in a Canadian copper mine. Probably his kindness and charitableness in later life, when fortune smiled upon him, were inspired partly by his vivid recollection of the long years when he found luck uncertain and coy. Much of the importance of Dr. Douglas in American mining was due to his personal influence on his contemporaries rather than to his own technical researches. In this respect he was unlike such a man as Uriah A. Boyden, the inventor of an improved water-turbine, or John Wesley Hyatt, the inventor of celluloid, on both of whom I also wrote. The latter spent his Sundays as a young man in trying to perfect a composition to substitute for ivory in billiard balls—not a very appropriate Sunday pastime for a man christened John Wesley.

Dr. Raymond, I was surprised to learn, was such a good Sunday-school superintendent in the Plymouth church, in Brooklyn, that when its distinguished pastor, Henry Ward Beecher, died, he was asked to succeed him in the pulpit—an unusual honor for a mining engineer, but one that he declined. For fifty consecutive years Raymond composed Christmas stories for the children of the Plymouth Sunday school, and he also tried his hand at writing a novel. His studying law in his late fifties and being admitted to the bar at such an age constituted another outstanding mark of the man. His partner, Rothwell, although a man of independent, almost aggressive, character, joined with a woman employed in the office of his publishing business to establish a fund for promoting the adoption of girl babies. He seems to have been exactly the type of man necessary at that time to build up the technical publishing business. Another early editor on whom I wrote was James C. Bayles, of *The Iron Age*, a type of the old-fashioned gentleman and literary light. His portrait shows a man of cultured tastes with a face like that of an artist, which indeed he was to some extent.

John Fritz, in whose name a medal of very high honor is awarded by the engineering societies, impressed me as an exceedingly conscientious and hard-working ironmaster, who devoted his life to developing the American steel business. He was self-taught in the school of hard knocks; for example, as a young man he experienced so much trouble with the breaking of gears that when he came to design a steel plant later he tried to avoid using gears at all. He introduced and tried out many improvements in the industry. The staff at the Cambria works were too hidebound for him to overcome their conservatism, but the Bethlehem company received him with cordial support, and he built them a plant which influenced practice all over the world.

I have also written on Philip Argall, Edward Balbach, Jr. (I had difficulty in evaluating his work, but was assisted by Prof. A. L. Walker, of Columbia), Charles Ethan Billings (pioneer in drop forgings), David T. Day, Joseph A. Holmes (a remarkable man, whose early death was a calamity), and Alexander C. Humphreys. The last, although a successful consulting engineer specializing in gas plants, and also the president of Stevens Institute, had a hobby for collecting paintings by American artists; in his old age he sold this valuable collection at a substantial advance over their original cost.

To me the impressive feature about many of these leaders in technique was their adventuresomeness and their friendships. The way, for example, in which Hennen Jennings as a boy was impressed by his neighbor Hamilton Smith, and resolved to be an engineer like him, led to Smith's giving Jennings his start in life, somewhat as Louis Janin gave Herbert Hoover his start. Hamilton Smith must have led as adventurous a life as Clarence King; apparently, he was not prepossessing in looks and was somewhat self-centered in conversation, but his cynicism and emphatic voice did not conceal his essential kindness and courage. It is unfortunate that more has not been written about him. He was a little early for Mr. Rickard to interview, and his extensive travels abroad, together with his diversions into civil engineering, kept him more of a man of action than one who left many records of his experiences. A man of such striking personality should write his memoirs when he retires. The early history of mining engineering in America would be enriched if a number of its outstanding members still alive would see to it that their memories are preserved for posterity.

P. B. McDonald.

New York City.

By the Way

Smoke Farming on the Canadian Border

THE following editorial from the Washington *Post* will be of interest to those who have smelter smoke problems, as well as to all specially interested in promoting international good will:

"Nothing could better illustrate the spirit of amity along the Canadian border than the reference to the International Joint Commission of the complaint by farmers in the State of Washington against the fumes of a smelting plant on the Canadian side, which destroys their crops and their livestock and is injurious to human health. The smelting concern says that business is business and that it cannot govern the veering of winds. It contends that its operation is equal in importance to the growing of crops. It cannot remove its plant or prevent fumes from spreading.

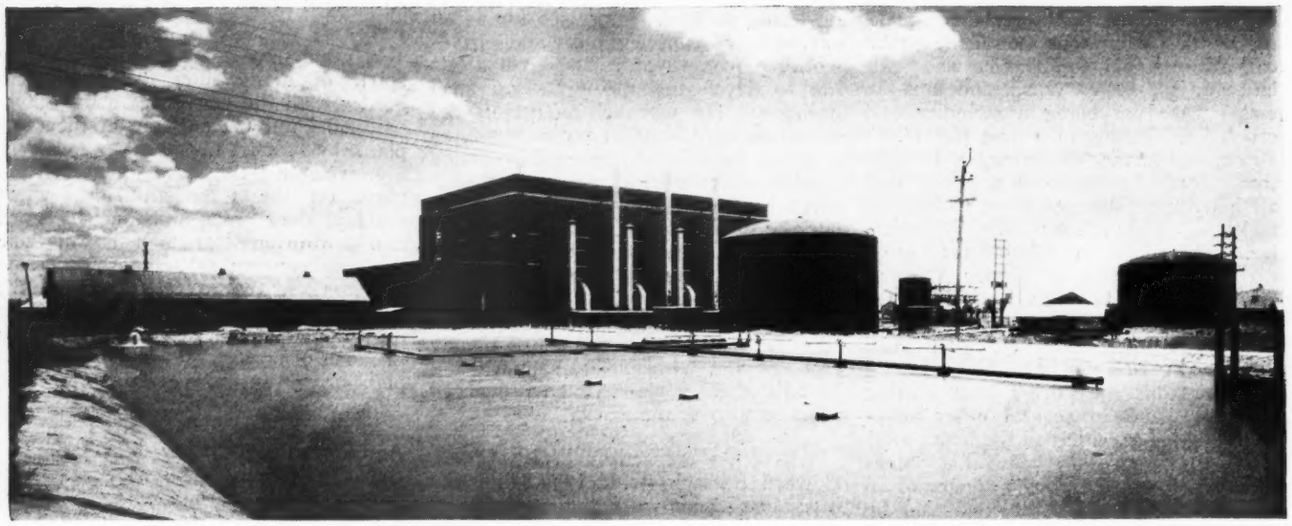
"Here is a local situation that affects a small group of industrialists, the one American and the other Canadian. The courts of either country lack jurisdiction. Instead of quarreling over the matter, the two governments have referred the controversy to the commission. It is the court of last resort in Canadian-American disputes.

"The case may be far-reaching in setting a precedent for responsibility in the use of the air. Therefore the decision of the joint commission will be awaited with great interest."

Triumphant Advance of the Female Continues

METROPOLITAN newspapers (edited by men, of course) not infrequently remark and lament the gradual passage into oblivion of many of the most sacred and formerly inviolable privileges of the male sex. The successful entries of the feminine forces into the smoking car, the barber shop, the electoral polling booth, and the realm of sport have all elicited comment. Mining men will probably hear with interest, and perhaps with concern, that still another sacred stronghold has been trespassed by French heels. From Tucson goes forth the word that the School of Mines of the University of Arizona is now the possessor of one aspirant for an M.E. degree who hails from the other, the gentler, the better sex. Miss Katherine Ysabel Morton, eighteen, of Webster Grove, Mo., has enrolled for the course in mining engineering. That Miss K. Ysabel is really imbued with a desire to engage in the profession is not strange, for her uncle, Louis E. Foster, of Silver City, N. M., is a practicing mining engineer. *Engineering and Mining Journal* confidently expresses the hope that success may attend her efforts on the dozen or so chicken ladders, descent of which may be incidental to the lady's first professional assignment.

INDUSTRIAL PROGRESS



General view showing Diesel plant, spray pond and oil-storage tanks

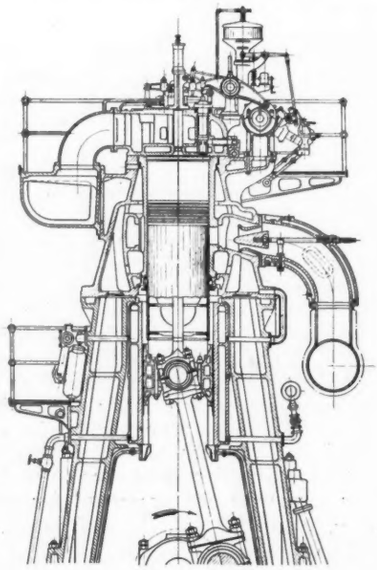
Tri-State Operator Reduces Power Costs With Central Diesel Plant

ENCOURAGED by the success of its venture in 1925 in building a central power plant for supplying compressed air to its various mines, the Commerce Mining & Royalty Company, of Miami, Okla., undertook to erect a power plant that would be centrally situated with respect to its various operations in the Tri-State zinc and lead district. The company's engineers believed that with the great amount of power used, and with the assurance that the ore reserves would permit mining for at least 35 years, power could be produced for substantially less than it was costing at the time, this according to George J. Stein, chief engineer of the company, in a paper presented at the Los Angeles meeting of the American Mining Congress on Sept. 10 to 13. At that time the company was operating a number of isolated plants having an aggregate capacity of 500 hp. in gas engines, all power beyond this capacity being purchased.

A survey was therefore undertaken in 1926 to determine what equipment was the most desirable. As a result, three 2,250-hp. Nordberg Diesel engines were selected, each driving a 1,500-kw., 2,300-volt, 3-phase, 25-cycle generator with 40-kw. direct-connected exciter. The engines run at 125 r.p.m. They have four cylinders, and like all other Nordberg designs are of the two-cycle type. They operate on the full Diesel principle—that is, fuel is injected by compressed air. With a bore of 28 in. and a stroke of 44 in. they are rated at 550 hp. per cylinder. This new Diesel plant, with its 6,750 hp., is the fifth largest in the western hemisphere. The decision to turn to Diesel power was influenced to some extent by the performance of three other Diesel plants which had been operating satisfactorily in mining service.

The site selected for the plant was just west of Cardin at a point about central with respect to the company's various properties and its present known ore reserves. This location was in reality decided upon in 1925, when the central compressor plant was built on the same site. The power plant supplies power for eighteen mines and mills, for the central air plant also, and for the Northeast Oklahoma Railway, a subsidiary road with 53 miles of track, and for standby service to the city of Miami. Construction was begun in August, 1926, and the plant was placed in operation a year later.

Cross-section of power cylinder



All of the details incident to the design, layout, and construction were handled by the engineering department of the company under the direction of Mr. Stein, in conjunction with the engineers of the Nordberg company.

In addition to building the power plant about 35 miles of primary and secondary transmission lines had to be built; also substations constructed at the mines and along the railway. The primary lines carry 33,000 volts and the secondary 2,300. The longest line going to any mining property is about 10½ miles in length. About 15 miles of line is required to reach the farthest railway substation.

The Layout

The three Diesel engines are housed in a building of 80x120-ft. inside dimensions and having 45-ft. headroom below the trusses. Ample space is left for adding a fourth unit. The building is of steel-frame construction, with Lock-Bond tile walls. In the basement are the water-circulating pumps, the centrifuge, fuel-oil filters, spare-parts storage, lockers, and change room for employees. The headroom is 10 ft.

The switchboard is on the engine-room floor. On an elevated platform in one corner is the plant engineer's office. A twenty-ton traveling crane serves the engine room proper.

The floor of the plant is enameled grey and is kept spotless. The basement floors are likewise kept free of water and oil, and impress one with their cleanliness.

Adjacent to the engine room at one side is the motor-service room, under the floor of which is the hot well. Beyond this service room is the central compressor-plant to which reference was previously made.

The exhaust mufflers, together with the air-filter chambers, are of reinforced concrete and are situated outside the west wall. Exhaust and suction pipes are 28 in. in diameter and are made of welded steel. The exhaust pipe is 28 ft. high and surmounted by a hooded screen.

Heavy fuel oil is stored in two 10,000-bbl. steel tanks, and light oil in a 15,000-gal. tank, all situated above ground. This provides oil for about nine months' operation with the average load thus far carried. Thus it is possible to purchase fuel in quantity under favorable market conditions. As a protection against fire a Foamite system is being installed. Since the plant was placed in service one tank has been used as a regular source of supply and the other for storage only. Each tank has a 250-sq.ft. heating coil of 4-in. pipe, connected to the discharge line from the hot well to the spray pond. A small vertical boiler is provided in the yard to furnish heating for tank cars in extremely cold weather. Fuel-oil storage for all three engines is carried in two daily fuel-supply tanks which are on the west wall just below the roof. Either tank will supply any two engines. Each has two compartments, one for heavy and the other for light oil. The oil flows from the tank to the filters just below them and thence to the fuel pumps. Tanks and filters are also provided with heating coils. Hot water from the exhaust jackets is taken for this purpose. To supply water at a higher temperature than is obtainable from the exhaust, a coil of 3-in. pipe is placed in the exhaust pipe. Water temperature is regulated to keep the fuel-oil temperature at about 120 deg. F. The daily supply tanks and filters are of Nordberg design. The heavy fuel oil is approximately 14-16 deg. Bé. and the light oil 32-36.

Lubricating System

With the exception of the power and compressor cylinders, lubrication to all parts of the engine is supplied from a gravity system. After passing through the engine, the oil drains into a Nordberg gravity-type filter placed in the basement. A gear-type pump, driven from the engine shaft by a chain, transfers the filtered oil to the three overhead lubricating-oil storage tanks placed on the same level as the fuel-oil filters. It is then ready for recirculation. These storage tanks are equipped with cooling coils, permitting a uniform oil temperature to be maintained. All the cooling water going to each engine is brought to these coils through a 6-in. line, but a bypass at the engine-room floor allows all or a part of water to be bypassed, depending upon the amount of oil cooling required. In winter it is not necessary to cool the oil.

In addition to purifying the oil by gravity filtration, a No. 6 Sharples centrifuge is used. The original charge of oil is still being used after nine months of service, the oil being clear and giving satisfactory lubrication.

The centrifuge is situated in the basement and is kept in constant service, it being customary to use it on the engine that is on the 24-hour run. The drain piping of each engine is so arranged that the oil going to any filter can be sent through the centrifuge instead.

Cooling Water Supply

One of the most important requirements for successful operation of any Diesel engine plant is an adequate supply of suitable cooling water, together with a properly designed cooling system. This detail has been carefully worked out in the Cardin plant. The source of supply is a near-by company mine, and fortunately the water carries little scale-forming material. Instead of depositing scale, as is the condition in most Diesel plants, the water seems to have a slight corrosive action, which is being corrected by treating it. After passing through the engines, the water drains into a 12-in. header, which empties into the hot well.

Pumping equipment for the water-cooling system is in the north end of the basement. Two pumps are provided for discharging from the hot well to the spray pond, but only one is normally required, the other pump serving as a spare. American-Marsh centrifugal pumps having a capacity of 600 gal. per minute at 75-ft. head are used. These are direct-connected to 20-hp. Westinghouse motors running at 1,450 r.p.m. The spray pond discharge line terminates in 24 spray nozzles. From this line a connection is made permitting a portion of this hot water to circulate through the heating coils in the large fuel-oil storage tanks. This line terminates in eight spray nozzles. From the spray pond, a 10-in. intake line leads to the basement, where there are three American-Marsh centrifugal cold-water pumps of 600-gal. per minute capacity at 175 ft. head.

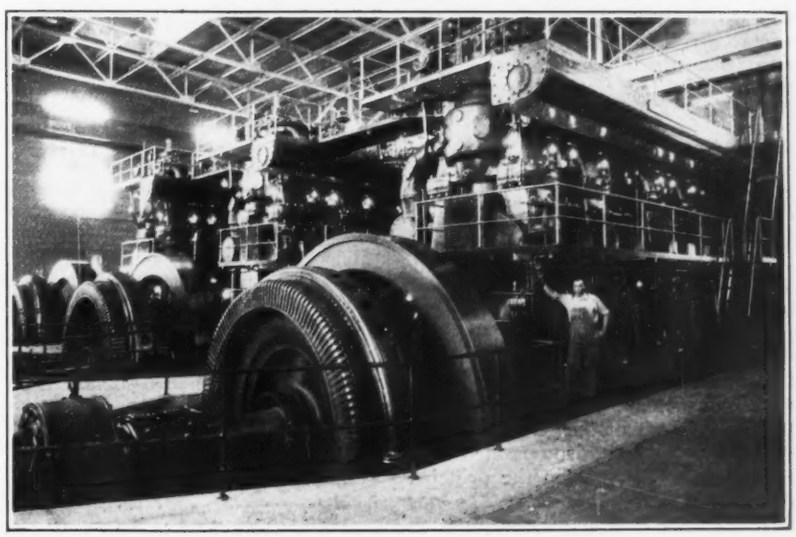
One pump is ordinarily used, except on hot days, when two are required. The arrangement of the piping also permits any one of these larger pumps to be used for discharging from the hot well to the spray pond, taking the place of the smaller hot-water pumps should they fail. These three pumps discharge into a 12-in. cold-water line at a pressure of between 70 and 75 lb. This line, from which the engine-cooling water connections are taken, is also connected to the 100,000-gal. overhead steel tank, about 100 ft. above the ground. By draining roof water into the spray pond, soft water is obtained for a portion of the make-up.

For eight hours during the day period the plant is carrying practically full load. In fact, there were times late in 1927 when it was necessary to transfer part of the mill load from the day to night shift. For the rest of the time the load drops as low as 400 kw. This results in an unfavorable load factor, slightly more than 30 per cent.

In addition, the power factor is low, this being 80 per cent from 8 a.m. to 4 p.m., 61 per cent from 4 p.m. to 12 p.m., and 53 per cent from 12 p.m. to 8 a.m. Even with the plant operating in this manner, it will pay for itself in six years, in view of the savings over purchased current at 1.75c. per kilowatt-hour.

The operating force consists of a plant engineer, three shift engineers working eight hours each, and an oiler on each shift. During the eight-hour heavy-load period, three engines are kept in service, but from 5 p.m. to 6 a.m. only one is required.

Present installation consists of three 1,500-kw. units, with space for a fourth unit



INDUSTRIAL NOTES

The Merco Nordstrom Valve Company recently moved its San Francisco office to 343 Sansome St.

The Bassic Manufacturing Company has changed its name to the Alemite Manufacturing Corporation. The address will remain the same—namely, 2650 North Crawford Ave., Chicago.

W. E. Tierney has been appointed representative in the South and Southwest for the Botfield Refractories Company, of Philadelphia. His headquarters will be in New Orleans.

Foster E. Benner has been assigned as sales engineer to the Chicago district sales office of the Traylor Engineering & Manufacturing Company, at 1414 Fisher Building, Chicago. Mr. Benner has been connected with the company's main office at Allentown, Pa., for several years as an engineer.

Douglas C. Corner has returned to St. Louis from a five-months business trip to Europe to accept the presidency of the St. Louis Power Shovel Company, builders of the Conway shovel. John L. Clarkson, formerly president of this company, is now acting in the same capacity for the Illinois Power Shovel Company, of Nashville, Ill.

Ground was broken recently for the new blade factory of the Ames Shovel & Tool Company, North Easton, Mass. The new structure will run parallel with the old plant and will be 400 ft. by 60 ft. in dimensions. It will be constructed of steel, concrete, and asbestos, and will be equipped in the most modern way. This will give the Ames company the largest single plant making shovels in the world.

The itinerary of the lecture tour to be made by Professor Frank P. McKibben under the auspices of the General Electric Company has been arranged. It extends from Oct. 4 to March 4, 1929, and will cover the entire country. Professor McKibben's lectures will deal with the application of electric arc welding to the noiseless construction of buildings, based on the experience of the General Electric Company and other pioneers in this field. The company named has already erected one large building and a few smaller structures by this method.

F. S. Chase, president of the Chase Brass & Copper Company, has announced that all products formerly sold by the Waterbury Manufacturing Company and the U. T. Hungerford Brass & Copper Company will now be sold under the Chase name and mark. A new trademark, namely, a figure half horse and half man, with bent bow and drawn arrow, will appear on all products of the amalgamated company in future. Last year the Chase companies bought the assets of the U. T. Hungerford company, which also operated brass and copper warehouses in the principal cities of the United States. The new chain will constitute the largest and most complete brass and copper warehouse system in the world.

The consolidation of Symons Brothers Company with the Nordberg Manufacturing Company has been announced. For the past 25 years the Symons company has been engaged in building crushers. The merger permits of a more advantageous use of the facilities of Nordberg for making crushers, which, incidentally, is not a new venture for that company. For some time a large proportion of Symons crushers have been produced in the Nordberg plant. A continuance of past policies is assured. The same representatives who have been engaged in selling and servicing Symons crushers will continue to do so. The crusher department will be transferred to the main office of the Nordberg company at Milwaukee. Branch offices will be continued at New York and Los Angeles.

International Combustion Engineering Corporation announces that negotiations have been completed for the purchase of the Hedges-Walsh Weidner Company, of Chattanooga, Tenn., a recent combination of the Casey-Hedges Company and the Walsh & Weidner Boiler Company, two of the oldest and most widely known boiler manufacturing companies in the United States. With this new company, International Combustion acquires a large and general boiler business, and augments its present extensive manufacturing facilities with two modern boiler plants, one of which is an outstanding factor in the sectional header boiler field; the other has facilities for the manufacture of the largest drums which can be made in the United States. This acquisition is in keeping with the company's policy of expansion along sound economic lines by the acquisition of going units of high standing, whose business fits in with the company's policy of completely covering the fuel-burning and steam-generating field.

PATENTS

SULPHUR. No. 1,685,231. Sept. 25, 1928. William H. Howard, Salt Lake City, Utah.

A method of recovering sulphur from furnace gases containing sulphur dioxide by bringing them in contact with a body of water to form a solution of sulphur dioxide, then passing a current of air in contact with the solution so as to form a mixture of air and sulphur dioxide, which mixture is then subjected to the action of incandescent carbonaceous material.

ORE TREATMENT. No. 1,684,006. Sept. 11, 1928. Quincy Bent, Edwin Barnhart and Frederick W. Wood, assignors of the Bethlehem Steel Company.

A process for rendering wet ores of plastic character suitable for a subsequent furnacing operation by passing them into the cool end of an internally and longitudinally rotary kiln, whereby the mass of ore is divided into several integral masses disposed longitudinally in the kiln, the kiln being rotated so that the masses are caused to pass upward and forward through it, thus subjecting them to a moderate degree of heat so as to effect a partial removal of their contained moisture.

ASBESTOS TREATMENT. Nos. 1,684,365 and 366. Sept. 11, 1928. S. H. Dolbear, assignor to Selective Treatment Company, Ltd., Montreal.

The first of these patents covers a method of treating asbestos which consists in reducing and separating it in pencil-like form from associated rock. The second covers a method which consists in subjecting the ore to under-water treatment, loosening the asbestos and at the same time preserving its natural length, thus causing the loosened material to pass into a body of water near the comminuting zone and maintaining it in a state of suspension until overflowed.

BULLETINS

FLEXIBLE COUPLINGS—The Falk Corporation, Milwaukee, Wis. Bulletin No. 180. Sixteen pages.

SPEED REDUCERS—Palmer-Bee Company, Detroit, Mich. A four-page pamphlet describing the company's herringbone speed reducers.

WATER TREATMENT—Rathbun Company, Inc., 212 W. Overland Street, El Paso, Tex. A four-page folder describing a so-called water lubricant known as "Scalina."

OIL ENGINES—Chicago Pneumatic Tool Company, New York. Bulletin 773, covering Class A-04 semi-Diesel oil engines; also Bulletin 788, covering vertical Simplex compressors, Type P6.

WELDING—Fusion Welding Corporation, 103rd St. and Torrence Ave., Chicago. Bulletin No. 129, four pages, on the subject of "The Influence of Manganese in Steel Welding Rods."

COMPRESSORS—Chicago Pneumatic Tool Company, New York. Bulletin 700, covering power-driven duplex air compressors, and Bulletin 720, covering straight-line steam and power-driven air and gas compressors.

DRY QUENCHING—Dry Quenching Equipment Corporation, 200 Madison Ave., New York. Bulletin DQ-3; a six-page folder, describing a new type of equipment designed to meet the coke-quenching requirements of smaller gas and coke works.

PUMPS—Byron Jackson Pump Manufacturing Company, 6th & Carlton St., Berkeley, Calif. Bulletin 273, covering multiplex centrifugal pumps, 32 pages; and bulletin 283, 24 pages, covering deep-well turbine pumps; also a 36-page bulletin on centrifugal fire pumps.

MINE VENTILATION—E. I. Du Pont de Nemours & Company, Fairfield, Conn. A 22-page booklet entitled "Auxiliary Ventilation for Metal Mines," which describes the development and use of Ventube, a flexible tubing which the company manufactures. About 35 illustrations are included, many of them being photographs of actual conditions in metal mines, showing the installation of the flexible tubing.

MILL AND LABORATORY EQUIPMENT—The General Engineering Company, 50 Broad St., New York, and Salt Lake City, Utah. General equipment bulletin, in which are bound together several catalogs on mill equipment, including the MacIntosh pneumatic flotation machine, the Geco flotation oil and reagent feeder, cup and wheel reagent feeders, lime and copper sulphate feeders, automatic samplers, and the Geco laboratory continuous fine-grinding and flotation plant, and other laboratory equipment.

NEWS OF THE WEEK

Summary

SMELTER fumes case brought against Consolidated Mining & Smelting by farmers in Washington is being heard at Northport, Wash., by the International Joint Commission. No mining engineers have as yet been designated to appear. Page 586.

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Adoption of a new method of prospecting by the Anglo-American interests in Northern Rhodesia is expected to assure thorough covering of the territory that the company has under concession. Details presented on page 589.

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Installation of a new hoist at the Morning mine of the Federal Mining & Smelting Company will permit sinking the shaft 1,000 ft. deeper at this silver-lead producer in the Coeur d'Alene district. Page 586.

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Sherritt-Gordon is negotiating for an extension of the railroad from Flin Flon to Cold Lake, where its properties are situated. This would mean an additional 40 miles of rail. Page 585.

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A new quicksilver producer may soon be established in Nye County, Nev., where Raymond Van Ness Mining is completing construction of a road to the property. Page 587.

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Granby Consolidated is involved in legal difficulties with West Kootenay Power & Light over the supply of electric power for its Allenby mine and mill. Page 588.

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The increase in copper miners' wages will affect 15,492 men in seven mining districts in Arizona. The "raise" will total about $212,000 a month. Page 586.

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Sub Nigel has made a new world shaft-sinking record. During August, the Betty shaft on the Witwatersrand was sunk 320 ft. Page 587.

Merger of Mond With International Nickel Not in Prospect

LORD MELCHETT, formerly Sir Alfred Mond, chairman of the board of directors of Mond Nickel Company, Ltd., visited the properties in the Sudbury district of northern Ontario on Sept. 30. In the course of an interview, he denied that merger of International Nickel and Mond Nickel, the two largest nickel-producing companies in the world, had been proposed or even contemplated.

In regard to the Mond smelter at Coniston, he confirmed the announcement recently made that an increase of at least 50 per cent in the capacity of the plant is being considered. It has not yet been decided, he declared, whether a new smelter will be built, with reverberatory furnaces, or whether the existing plant will be altered so as to meet the requirements of the ores from the Frood mine, which is expected to start producing in 1930 or 1931. These matters will be decided during the coming year.

Mond Nickel owns the Frood, Levack, Garson, Victoria, Worthington and North Star mines, in the Sudbury district. In addition to nickel, the ore carries copper and some of the precious metals. Ore reserves are estimated to be sufficient to last from 40 to 45 years. The company also owns the smelter at Coniston, a refinery at Clydach, near Swansea, the entire capital of the Lorne Power Company, which supplies the mines and plants in the Sudbury district with power; the American Mond Nickel Company, the nickel-manufacturing firm of Henry Wiggin & Company, and a half interest with Central Mining & Investment in the Victoria Syndicate, Ltd., which is investigating and developing properties in British Columbia.

Anaconda Files Reply Brief in Carson Suit

ANACONDA COPPER MINING has filed a brief in the U. S. Supreme Court in reply to that presented by Carson Investment involving alleged infringement of copper-refining process patents. It is claimed by Anaconda that the litigation should not be connected with the earlier suit in which American Smelting & Refining was involved.

Anaconda further alleges that George Carson is not mainly interested in the suit, but that the principal parties are a syndicate of Pacific Coast capitalists, headed by Rudolph Spreckels, who are endeavoring to levy a tribute on the copper industry by means of these patents. If the patents are sustained, Anaconda maintains, an increase in the cost of copper will result through a change in the present methods of treatment.

Sherritt-Gordon Negotiates for Extension of Railway

NEGOTIATIONS are now being made by Sherritt-Gordon for an extension of the railroad from the Flin Flon mine, of Hudson Bay Mining & Smelting, at Herb Lake, to its properties at Cold Lake, northern Manitoba. This extension would be about 40 miles long, and officials of the company are anxious to have the work started immediately, so as to take advantage of the fact that the organization which built the extension from The Pas to Flin Flon is still on the ground. If the negotiations are successful, the same arrangements will probably be made as were agreed upon by Hudson Bay Mining & Smelting.

Development of the Ook claim, which adjoins the original Sherritt property on the west and which was acquired recently, has shown ore of higher than average grade for a length of 1,000 ft. and to a maximum vertical depth of 790 ft. The most recently completed hole struck ore at 732 ft. depth, showing a width of 13 ft. and assaying 3.53 per cent copper, 1.79 per cent zinc, and $1 in gold and silver.

Chief Consolidated Prospects with Churn Drill

PROSPECTING by churn drilling has been started by Chief Consolidated Mining on the Apex Standard tract, situated in the East Tintic district of Utah. Owing to heavy fissuring in the district, diamond drilling has been largely unsuccessful, and for this reason Chief Consolidated decided to employ churn-drill methods of exploration.

The first hole had reached a depth of 600 ft. on Oct. 3, and, when it is completed, the drill rig will be moved to another site about 1,100 ft. distant.

Silver Producers' Association Re-elects Board of Directors

AT the annual meeting of the American Silver Producers' Association, held in Salt Lake City on Oct. 8 and attended by representatives of more than 90 per cent of the membership, the present board of directors was re-elected for the coming year. W. Mont Ferry, president of the organization, presided. Thomas D. A. Brophy, advertising manager, reported that as a result of the three-year national advertising campaign, conducted jointly by the association and the Sterling Silversmiths' Guild of America, sales of sterling-silver manufactured articles had increased 24 per cent.

Members of the board of directors of the American Silver Producers' Association are Robert E. Tally, Arizona; Alfred Harrel, California; Jesse F. McDonald, Colorado; James F. McCarthy, Stanly A. Easton, and Jerome J. Day, Idaho; Erle V. Daveler, Montana; John G. Kirchen and J. C. Kinnear, Nevada; W. Mont Ferry and E. J. Raddatz, Utah; Frank M. Smith, Washington; and C. F. Kelley, F. H. Brownell, and F. Y. Robertson, New York. The directors will meet in New York next month to elect officers and an executive committee for next year.

Wage Increase Will Affect 15,492 Miners in Arizona

The increase in the wages of copper miners, referred to in the Oct. 6 issue of *Engineering and Mining Journal*, will affect 15,492 men employed in the seven principal mining districts of Arizona. On a basis of an average increase of 10 per cent, this means an addition of $212,664 to the monthly payroll. Details follow:

District	Employees	Monthly Payroll	Increase
Bisbee-Douglas..	4,274	$544,108	$54,411
Globe-Miami ...	4,101	581,428	58,143
Clifton-Morenci..	1,107	154,713	15,471
New Cornelia-Ajo	963	122,246	12,225
Ray-Hayden ...	1,608	196,379	19,638
Magma-Superior	764	112,222	11,222
Jerome	2,675	415,547	41,554
	15,492	$2,126,643	$212,664

Drift at Arcadian Consolidated Driven 200 Ft.

AT Arcadian Consolidated, the drift running south in the New Arcadian vein, at the 1,700 level of the New Baltic shaft, has reached a distance of over 200 ft. This lode has been mineralized all the way, by far the greater portion showing commercial copper content. A considerable flow of water from No. 8 conglomerate vein, which was tapped by a crosscut from the 1,250 level, has been interfering somewhat with development work, and it was found advisable to construct a dam in the crosscut. The dam has been completed and development work will be continued with much less interference.

Drifting north on the New Arcadian vein will be started soon, and another drill put to work at that point. It is the intention of the management to hasten development of the vein. Already results have been obtained that lend encouragement to the belief that the vein will prove of permanent value.

Hearings Begin in International Smelter-Fume Case at Northport, Wash.

By Paul Wooton
Special Washington Correspondent

IT IS assumed that before the International Joint Commission and the State Department go much further with the investigation of damage in the State of Washington caused by fumes from the smelter of the Consolidated Mining & Smelting Company of Canada at Trail, B. C., some advice from those familiar with such problems will be sought. A commission of agricultural specialists was named months ago. The State Department, heretofore not credited with familiarity with the mining industry, has formulated the plan to be followed in attacking the problem and has called in the International Joint Commission — another agency whose work has been with matters remote from mining. Thus far no mining engineer has appeared in the case, despite the fact that formal hearings began Oct. 9 before the Joint Commission in Northport, Wash.

It is a matter of regret to some American mining men that an undertaking so outstanding and enterprising as the Trail smelter—a great industry in what was a waste country—should be compelled to undergo the troubles and expense incident to the slow processes of international proceedings when it is understood that there has been entire willingness to compensate legitimate damages.

The general manager of this plant is Selwyn G. Blaylock, to whom the A.I.M.E. presented the James Douglas medal for distinguished achievement in metallurgy. This recognition is cited as an indication that the smelter is in competent hands.

From what is known of the tactics of "smoke farmers" and of the burdens heaped upon smelting plants in the past by smoke suits, the hope is expressed that technical mining men will be called in to advise the Joint Commission and the State Department if it really is necessary to bring these ponderous agencies to bear on the problem.

Shaft Repairs Being Made at Idaho-Maryland

Shaft repairs are being made at the Idaho-Maryland mine, near Grass Valley, Calif. A new concrete collar is being placed in position. Preparations for additional development work are being made. A strike of high-grade ore was recently reported at this property.

Morning Installs New Hoist

A new hoist is being installed at the Morning mine, owned by Federal Mining & Smelting, in the Cœur d'Alene district of Idaho, which will permit sinking the shaft to an additional 1,000 ft. in depth. A 600-hp. d.c. motor with motor-generator set supplied by General Electric, will be needed to drive the new hoist, which was built by Nordberg Manufacturing. At present the main shaft at the Morning mine is bottomed 2,450 ft. below the main operating tunnel. The operators plan to have the hoist operating by December.

Acquire Lease on South Yuba

The bond and lease held by James D. Stewart, of Auburn, Calif., on South Yuba Mining & Development's property near Omega, has been sold to a syndicate controlled by Walter Sims, of Jackson, Calif. T. L. Larson is superintendent of operations.

Dome Mines Drops Option on Chibougamau Claims

Alexander Fasken, secretary of Dome Mines, announces that the company has relinquished its option on the holdings of the Chibougamau Prospectors' Syndicate because of the large purchase price, which, it is understood, was $500,000 for a 75 per cent interest. The holdings consist of 153 claims in northwestern Quebec, with a total acreage of 6,310 acres.

Hoist Accident Kills Four

Four miners were killed at the Aztec mine of Smith, Davis & Company, near Hockerville, Okla., in the Tri-State district, when the hoist in which they were being lowered met with an accident, the nature of which has not been determined. The dead are H. Stroyick, Henry Ferguson, Levi Robinson, and Leslie Parks.

Start Building Tybo Mill

Work has been started on the construction of the flotation plant of the Tybo branch of Treadwell Yukon, situated about 50 miles northeast of Tonopah, Nev. It is expected that the first unit of the plant will be ready for operation by the first of the year. The decision of the Treadwell Yukon Company to erect a plant at the Tybo mines, which carry a lead-zinc-silver ore, followed favorable developments on the 700 level, where more than 2,000 ft. of drifts have been driven east and west. Since then the shaft has been sunk still deeper, and results have fulfilled expectations.

Sub Nigel Makes a New World Record for Shaft-Sinking

ANOTHER world's shaft-sinking record has been made on the Rand. During the month of August, the Betty shaft of the Sub Nigel gold mine was sunk 320 ft. in 31 days. This is not only a new record for the Rand, but for every mining country, as far as sinking rectangular shafts is concerned.

The Betty shaft has dimensions of 32 ft. by 9 ft. Three continuous shifts are worked, and the machines employed in making this remarkable record were ten Model 37 Turbro Waughammer drills supplied by the Gardner-Denver Company. This new record supplants the one held by Springs Mines, also a Rand producer, of 300 ft. in a similar period.

The Betty shaft at Sub Nigel

United Verde Extension Enters Sudbury District

UNITED VERDE EXTENSION, which owns a copper mine and smelter in the Jerome district of Arizona, has taken an option on the Mount Nickel property, about 5 miles north of Sudbury, Ont., and intends making an electrical survey of the property. Mount Nickel is one of the oldest properties in the Sudbury district, having been located in August, 1885. A shaft was sunk to a depth of 175 ft., by a company known as the Great Lakes Company, and some drifting was done at that level.

United Verde Extension took over the Murray claims in the Rouyn district, but after a campaign of exploration in 1927 and early part of 1928 they were sold to Mining Corporation of Canada.

New Dredging Unit for Tin Mines of Dutch East Indies

The Netherlands East Indian government, which holds a monopoly of tin mining in the Dutch East Indies, has just put a dredging unit into operation on the island of Banka, according to the New York *Journal of Commerce*. This is the third unit installed at the mines in Banka. Dredging had previously been done by Chinese coolies with ground pumps, and the new installations are said to have been adopted on account of the uncertainty of obtaining sufficient workers.

Will Enlarge Big Jim Mill

The capacity of the milling plant at Big Jim Mines, near Patagonia, Santa Cruz County, Ariz., will be enlarged to handle production from both the Big Jim mine and the Hardshell group, recently acquired from the Richardson estate. At present, the capacity of the mill is about 75 tons of silver-lead-zinc ore daily.

A force of men under D. C. Pickering, superintendent of the company, is installing machinery and putting the Hardshell group into condition for operation. J. J. Burns, formerly mill superintendent of the El Tigre mines, in Mexico, has been placed in charge of the Big Jim mill.

American Zinc Is Developing Jarnagin Lease

American Zinc is sinking a shaft at the Jarnagin lease, in Jefferson City, Tenn., about 16 miles east of Mascot, where it operates the Mascot mine. The work on the Jarnagin is being done to comply with the terms of the agreement under which the property was leased to the company, according to William A. Ogg, president. The ore blocked out so far averages somewhat better than 3.5 per cent zinc. Present plans call for shaft-sinking to a depth of 350 ft.

The company does not intend to erect a mill on the property, but will transport the ore to Mascot for treatment at the plant there.

Production Started at Johnson Copper

The first carload from the crosscut on the 250 level of the main shaft of Johnson Copper, in Cochise County, Ariz., has been sent to the smelter, according to Ralph R. Wilson, vice-president. This was taken from a point about 100 ft. north of the shaft. Work is also proceeding on a ledge, 6 ft. wide, south of the shaft on the same level. From 15 to 20 inches is said to be high-grade copper-silver-gold ore.

Sinking of the main shaft to the 360 level has been completed, and a station has been cut at that point.

New Cinnabar Property Being Developed in Nye County, Nevada

A NEW cinnabar property is being developed between the towns of Belmont and Manhattan, Nye County, Nev., in what is known as the Spanish Belt mining district. The new property, which is known as Raymond Van Ness Mining, is on a granite contact, the ore being found in the granite and the shale. A shaft has been sunk 30 ft., exposing from 4 to 6 ft. of ore that is expected to average about 5 per cent quicksilver. A trench, about 100 ft. from the original point of discovery, has opened up a parallel orebody, 6 ft. in width, showing a content of about 7 per cent.

A road, about two miles long, is being built from the old Barcelona mine to the property, which is situated at an elevation of 8,000 ft. Water will be piped to the mine by gravity for a distance of 4,000 ft. A reduction plant has been ordered and will be installed on completion of the road. It is hoped to have the plant in operation before winter.

In the same district, and about six miles farther north, the Flowers quicksilver property recently started operating two D type retorts.

Copper Range Output Greater —Champion Is Drilling

COPPER RANGE production from the mines in the Michigan copper district is now considerably more than 2,000,000 lb. of refined copper per month. The improvement is to be credited to the return of men from the farms and from various summer occupations. The labor situation generally in the district is satisfactory, although there is room for more men. Underground operations are being increased as labor becomes available.

Drilling operations in Champion Copper's exploratory tract, half of which is owned by Copper Range, are proceeding satisfactorily. The drill has reached a depth of 250 ft. from surface, about 100 ft. of which is in the ledge. It is going through the upper series of the Ashbed lode, which was worked by the old Atlantic. A little copper is indicated, but commercial mineralization was not anticipated in this horizon. Ore will be found, if at all, at greater depth, in the main beds.

The Radiore company will continue electrical prospecting in this territory, although there will be a lull for a week during which the prospectors will do some work in the iron district. This will afford opportunity for a study of maps and data of Radiore work to date in the exploratory tract. Indications have been numerous, but their interpretation offers the real problem. Indications have been obtained off the lodes as well, which may be due to faulted ground, the presence of sulphide fissures, or salty minerals. The chief difficulty lies in interpreting results.

Johannesburg, center of a district which produces about 10,000,000 oz. of gold a year.

Johannesburg Made a City as Native Labor Negotiations, Which May Affect Its Prosperity, Are Carried On

THE two outstanding events of importance in Johannesburg recently have been the celebration of the elevation of "Jo'burg" from the status of town to city and the conclusion of the pourparlers, relating to the labor supply for the gold and coal mines of the Transvaal, between the government of the Union of South Africa and the representatives of Mozambique (Portuguese East Africa).

Johannesburg was founded in 1886 and has since become the center of the most productive gold field of the world. The mines on the Rand have produced gold to the value of almost £1,000,000,000 in that time, and Johannesburg has kept pace by increasing its population to 237,100. The mines on the Rand alone employ almost 200,000 men.

Closely linked with the future prosperity of the "Golden City" is the question of the supply of labor from Mozambique. Negotiations in regard to this all-important matter have been in progress for some time. A draft agreement was entered into in May of this year, in Lisbon, between C. W. Malan, Minister of Railways of the Union, and the Portuguese authorities. The agreement related to labor supply, customs, railways, and the use of the port of Lourenco Marques. Ratification of these matters is now proceeding, after prolonged discussion, in Pretoria.

So far as can be ascertained, the probable result will be that the labor supply will be on the basis of decreasing numbers and the problem of making up this shortage by recruiting in other areas and by extending the use of labor-saving appliances is being investigated.

Granby Consolidated Is Involved in Litigation Over Power Supply

MINING men in British Columbia are watching with interest the legal struggle between the Granby Consolidated Mining, Smelting & Power Company and the West Kootenay Power & Light Company, the Consolidated Mining & Smelting Company of Canada's power subsidiary. Consolidated needs all the power for its own activities, present and prospective, that its subsidiary is capable of developing, and it is unwilling that its subsidiary shall sell power unless such sales bring custom to its Tadanac smelter.

Granby depends on the West Kootenay company for electric energy to operate machinery at its Copper Mountain mine and Allenby mill. Until recently it has been getting its copper concentrate smelted at the Consolidated smelter at Tadanac, B. C., but during the last few weeks it has been shipping the bulk of its concentrate to Tacoma, Wash., where it not only gets better treatment terms but whence the finished product is shipped more cheaply to Eastern markets by water than overland from Tadanac. Since under these conditions the power brings little custom to Consolidated M. & S., West Kootenay threatened to cut off the power unless the concentrate was shipped to Tadanac for treatment, under the technicality that under its charter it is permitted to supply power only to points within a radius of 50 miles from Rossland, where the head office of the company is situated.

Granby applied to the Supreme Court of British Columbia for an injunction restraining West Kootenay from interfering with the normal supply of power to its Copper Mountain mine and Allenby mill, and Justice Murphy granted the injunction, but upon further argument by the power company's counsel dissolved it. Granby then applied to the Appeal Court of British Columbia. The appeal will be heard in the latter half of October. On obtaining the injunction Granby started to ship concentrate to Tacoma.

In the meantime Granby is paying particular attention to its northern properties. It has relinquished its option on the Outsider mine, on the west shore of the Portland Canal, from which it shipped 34,729 tons in 1926 and 13,695 tons in 1927, of siliceous copper ore to Anyox, and is moving the machinery to the Bonanza mine, near Anyox, which it expects to bring to the producing stage early in 1929. It is reopening the Granby Point quartz mine, which was closed after the destruction of the buildings by a brush fire, in 1923, and is moving buildings from its logging areas, near Alice Arm, to Granby Point. Also, Granby has bonded the Hanna property, of 14 claims, adjoining its Hidden Creek mine, and has let a contract for the electrical prospecting of the claims; and it is exploring a group of claims on James Island, 30 miles south of Prince Rupert.

Coniaurum Mill Is Now Treating 300 Tons Daily

An average of 300 tons of gold ore is now being treated daily by the new Coniaurum mill, in the Porcupine district of northern Ontario. Only one tube mill is operating at present, and the addition of another is expected to double the mill capacity. Since July, when it first started operations, four shipments of bullion have been made.

Suit Over Cerro Gordo, Calif., Rights Is Settled

Litigation between Estelle Mines and Cerro Gordon Mining, both companies operating near Cerro Gordo, Inyo County, Calif., has been settled, and Estelle Mines has obtained leasehold rights to Cerro Gordo holdings. Mining operations have been started on the La Despresiada claim, where a discovery of ore was made on the 900 level a few years ago.

Johannesburg Letter

By Owen Letcher
Special Correspondent

Anglo-American Is Organizing New Prospecting Method for Northern Rhodesia

Johannesburg, Sept. 3, 1928.—The extensive prospecting that is being carried on in Northern Rhodesia by Loangwa Concessions, Rhodesian Congo Border Concession, and other Anglo-American and Bechuanaland Exploration interests, coupled with the profound faith that those associated with the venture have in the mineral future of Northern Rhodesia, has attracted the attention of many who had previously looked on prospecting as a haphazard speculation, warranting the expenditure of as little money as possible. Under the guidance of Dr. J. Austin Bancroft, recently Professor of Economic Geology at McGill University, in Canada, and now consulting geologist at Broken Hill for Anglo-American, an organization has been built up whereby practically the entire area of Northern Rhodesia is being combed for mineral wealth.

INSTEAD of the old type of prospector being sent out into the field to see what he might stumble over, most of the prospectors, or geologists as they are in reality, that have been appointed are young, technically trained men. These young men—there are approximately 60—are sent out in pairs, each with a traverse wheel (an accurate account of mileage has to be kept), a prismatic compass, a clinometer, and the usual paraphernalia of the prospector, to selected areas inside the 150,000 square miles over which concessionary rights are held.

The two men have a definite routine laid down for them; they are expected to do 15 to 20 miles of traversing daily. Traverses are run by compass bearing. At the end of his traverse the prospector proceeds a quarter of a mile—or an eighth in some instances—to his right, or left as the case may be, and returns on a line parallel to that taken on his outward journey. It will be seen that in this way a complete and thorough geological survey is being made, and the chances of missing a deposit of value are thereby considerably minimized.

The "prospector" has to take the dip and strike of each outcrop that he sees, and is expected to send in numerous specimen samples of the country rock of his area. The two prospectors of the party, although working independently in the compilation of the monthly prospecting reports and the various other statistical data required, combine in the monthly map of their joint activities that has to be compiled. In this map every dip and strike taken, every native village, every path, stream, road, mountain, and hill, must be plotted in its exact position, and the joint result sent into headquarters at Broken Hill.

The complicated problem of transport has been solved by the cutting of roads from Broken Hill to the various permanent base camps within the Concession and the acquisition of six-wheeler Morris lorries, Dodge and other trucks. Scheduled services are run between these points and Broken Hill. The lorries, on the outward journey, take provisions and mails to the men in the field, and return with samples of country rock and those of supposed mineral value for assay.

Mexican Premier Will Build New Smelter at San Jose Mines in Sinaloa

CONSTRUCTION of a 150-ton lead smelter is being undertaken by Mexican Premier at its San Jose properties, 47 miles from Mazatlan, State of Sinaloa. There is a 100-ton flotation mill on the property, which produces a concentrate containing silver, lead, and gold. The mines, which include the Isabela, Sorpresa, San Jose, and Alacrans, are operated by San Jose Mining, all of the stock of which is owned by Mexican Premier. At present concentrates are shipped to the Potosi smelter of American Smelting & Refining.

May Reopen San Miguel Mines in Zacatecas

Reopening of the mines of San Miguel del Oro at Pinos, State of Zacatecas, is expected as the result of a recent examination of the property by P. F. Garcia, of San Antonio, Tex. At one time these mines were among the most important in Mexico. They are situated about 36 kilometers from the Hinda station on the Mexican Central Railroad. Work at the properties was abandoned because of inability to handle a large flow of water. The deepest workings, in the San Jose shaft, were only about 900 ft.

Keystone Copper Developing Two New Orebodies

Keystone Copper, operating at Dragoon, Cochise County, Ariz., is developing two orebodies recently found in the mine. On the 350 level, a chalcopyrite orebody, said to assay 15 per cent copper, has been found and the work of sinking a winze was started. A large flow of water was struck, however, and operations were stopped at that point. A station is now being cut at the 440 level, from which a crosscut will be driven to the orebody. Another orebody has been found on the 475 level near the Hagerman shaft. The company has a 350-ton capacity concentrator.

Toronto Letter

By Our Special Correspondent for Northern Ontario

Kirkland Lake Gold Orders Equipment for Sinking to 5,500 Level

Toronto, Ont., Oct. 6, 1928.—A new hoist has been ordered for the main winze at Kirkland Lake Gold, in the Kirkland Lake district of northern Ontario, and should be delivered in October. This will permit sinking the winze to a total depth of 5,500 ft. An official report of the company states that the winze has been completed to a depth of 3,000 ft. and levels opened up at 2,600, 2,725, 2,850, and 2,975 ft. On each of these levels, orebodies have been uncovered, and, although no level has been entirely explored, sufficient ore has always been available for mill requirements. Mention is made of the occurrence of tellurides on the 2,725 and 2,850 levels. This is taken as an indication of the possibility of richer orebodies at depth.

ARRANGEMENTS have been completed for the transfer of the assets of Beaver Consolidated Mines to a company to be known as Northern Canada Mining Corporation, with a capital of 5,000,000 shares of no par value, as compared with 2,000,000 shares of $1 par in the old company. Of the new shares, 500,000 will be sold at 70c. a share.

Northern Canada Mining Corporation will be operated as an investment, holding, and exploration company. Beaver Consolidated operated in the Cobalt district for many years and developed Kirkland Lake Gold Mines up to the time of its reorganization. The main asset of Beaver Consolidated was approximately 1,000,000 shares of Kirkland Lake Gold stock.

Recent discoveries in the Bell River district are creating a good deal of interest, and a number of companies have staked properties there. This new district lies near the shores of Lake Mattagami, in northern Quebec, 96 miles north of the railroad. By the river route, it is 150 miles, with ten portages. Quebec Fisheries operates a transport system into this district with tramways on the portages and barges and tugs on the waterways.

The most important staking made in this district appears to be that of the Dunlop syndicate, where gossan has been found over a width of 150 to 200 ft. and over a length of about 3,000 ft. On a second trip to the discovery, blasting and surface trenching has shown massive pyrrhotite containing chalcopyrite over a width of 40 ft. Arrangements are being made to put a diamond drill on the property. Other companies, including Mining Corporation of Canada, and Mentor, have holdings adjoining the Dunlop.

Societies, Addresses, Reports

Mine Safety Meeting in New York Draws Large Attendance

MEANS of inducing the mine workers to realize the value of safety to themselves and their families formed the main subject of the sessions of the Mining Section of the National Safety Council at the annual congress of the latter Oct. 1 to 5, held in New York City. The coal and metal mining men held their meeting at the Waldorf-Astoria.

C. A. McDowell, safety and personnel manager, Pittsburgh Coal Company, Pittsburgh, as chairman of the section, presided and opened the meetings by reading the reports of the various committee chairmen for the work of the past year.

R. M. Lambie, chief inspector of the State of West Virginia, Charleston, W. Va., addressed the meeting on the subject "Safety Pays." It paid large dividends and could not be attained without a proper investment in safety aids, he said. In 1920 the State Safety Campaign was started that culminated this year in a safety meet at Bluefield, W. Va., at which 23,000 gathered and 180 teams took part. Before the campaign started one life was lost for 175,000 tons mined. During the present year for each fatality 360,000 tons had been mined, proving the effort fully justified. The safety movement had saved $900,000 to the operators and far more to the mine workers of that state, he said.

In the subsequent discussion, C. S. Hurter, of E. I. du Pont deNemours & Company, said that the Pittsburgh Limestone Company gave each man a badge who had achieved a five-year no-accident record. He declared this had greatly stimulated a desire to avoid unnecessary hazards.

Arthur Crowfoot, of the Phelps Dodge Corporation, said that a watch fob was presented by the Corporation to every man who worked without an accident for one year. It was intended at the Morenci mill to have every man, after four or five months' employment, pass an examination on safety rules. A belt with a silver buckle was to be given to everyone making 80 per cent at the examination. The foremen would be similarly rewarded if they made 90 per cent.

W. C. Bockert, of the St. Joseph Lead Company, said that his firm paid each foreman 1c. for every man-shift unaccompanied by an accident and assessed them 50c. for every man-shift lost by a casualty. The first day of injury was not charged against the foreman. This provision was made, he said, to encourage foremen to urge their men to take cognizance of injuries and have them treated promptly, thus avoiding infection. The charge was levied for only a month to give the foreman a clean slate and to encourage him in maintaining a good safety record.

W. D. Brennan, of the Stag Cañon branch of the Phelps Dodge Corporation, Dawson, N. M., said that the cost for compensation at his mines had dropped from 5c. to 3c. per ton as a result of activity in promoting safety. F. S. Lenhart, of the W. L. Rainey Company, said that the mine which had the best safety record was recognized by his company by sending the official to the annual congress of the National Safety Council. H. G. Hensel, of the Youngstown Sheet & Tube Company, Youngstown, Ohio, said if a foreman did not report that he was correcting hazards such as the safety men were continually finding uncorrected in his mines the fact was regarded by the safety committee as evidence of indifference.

Officers, Mining Section National Safety Council 1928-29

Chairman, George Martinson, Pickands, Mather & Company.

First vice-chairman, A. W. Dickenson, Union Pacific Coal Company.

Second vice-chairman, J. P. Hodgson, Phelps Dodge Corporation.

Third vice-chairman, F. C. Miller, Colorado Fuel & Iron Company, Trinidad, Colo.

Fourth vice-chairman, R. N. Hosler, Pennsylvania.

Secretary, Daniel Harrington.

H. S. Gilbertson, director of personnel, of the Lehigh Coal & Navigation Company, Lansford, Pa., spoke on "Methods and Results of Improved Foremanship Conferences." He said that the company had endeavored to show the foreman how his duties could be performed so as to give the best results as to economy, safety, and amicable relations with the mine workers. Much had been done to prepare young men for foremen's jobs.

Fred H. Nesbit, of the Tri-State Zinc & Lead Producers Association, said that the association had tried accident-prevention club meetings, with attendances that dwindled and interest that steadily flagged; so a monthly banquet was provided for foremen. As a result of the banquet discussions, accidents at the 216 mines belonging to the members of the association had been cut 50 per cent and fatalities to a third of what they were.

H. C. Henrie, of the Phelps Dodge Corporation, said that as a result of the foremanship conferences rules had been made defining the best way of performing every item of operation. It was found on analysis that there were 23 operations in loading ore into a car, and a best way of doing each one.

Interest in Safety Must Begin at Top

Cleveland E. Dodge, vice-president of the Phelps Dodge Corporation, presented a paper on "Educating the Miner in Safety." Several years ago his company had found that its accident-prevention work had reached a static condition, he said, so that a new approach seemed necessary to obtain further improvement. Study made it evident that the weakness lay in placing the responsibility for safety on a few special men, rather than in considering it a major part of operations in which the responsibility would fall on all operating officials. As a result one committee was organized for the whole company, with the general manager as chairman; also a committee for each separate branch, headed by the local manager, and in addition different committees representing smaller divisions of work. The new plan led to the present success of the company in its safety work. Diplomacy and tact were needed in putting safety rules across, and for this reason it was best that safety work should start at the top, he said. In closing, Mr. Dodge made a special plea to all officials of mining companies to take the responsibility of safety work to heart and to exert themselves conscientiously in furthering the cause.

In the discussion that followed, Frank A. Ayer, manager of the Phelps Dodge company's Morenci branch, said that safety was put ahead of cost and production. Not until everyone gave it similar recognition, he thought, would the limit be reached in safety work.

Here Mr. Dodge rose to say that the emphasis placed on safety by his company had improved discipline in general and so had increased efficiency.

Further discussion brought out the fact that safety trophies were effective in interesting the men in safety work. The use of safety hats and shoes was considered at some length, principally by Mr. Brennan, of the Phelps Dodge coal mines. They were using two types of shoes—namely, rubber and leather, the best of these being not very good, he said. Over 80 per cent of the men were wearing hard-toe shoes. The company had found, however, that the types of shoes used did not protect the

little toe sufficiently. It was therefore looking for a shoe with a cap that would go all around the toes. The subject of the best type of goggles also received attention.

D. Harrington, speaking to the coal men present, said that if the Phelps Dodge Corporation at Dawson, N. M., could have such a good record as it had with regard to falls of roof in its mines, every mine in the United States ought to have as good, because none of them had a worse roof than was found at Dawson.

"The Safe Handing of Explosives Underground" was the topic of S. P. Howell, explosive engineer, of the U. S. Bureau of Mines. Mr. Howell took for his theme the proposition that to reduce underground accidents from explosives to a minimum, the safest accessories should be chosen and approved methods should be used and adequate supervision provided. After use of electrically fired permissible explosives in coal mines, he turned his attention to the metal-mining field and sketched the characteristics of gelatin dynamite, the explosive most commonly used there. He made a plea for the use of electrically fired permissible explosives in certain types of metal mines, and urged that greater use be made of electrical detonators having electrically-short-circuited legs. He thought also that permissible electric cap lamps were suitable for use in metal mines in handling explosives, and, for that matter, for general use in metal mines. Referring to the practice of thawing explosives, he said that the purchase of extra low freezing dynamite would make thaw houses obsolete.

Mr. Nesbit, of the Tri-State Association, told how Mr. Howell's campaign in his district in 1926 had resulted in a great decrease in the number of accidents caused by explosives. Mr. Hurter said that in addition to short-circuiting the legs of the detonator, it was advisable also to have the leads shorted at the point of firing until the time came for firing. Mr. Nesbit said that he had become convinced that it was impossible to have a fuse that burns too fast. Mr. Russell, of the du Pont company, said that it was impossible to make a fuse that would "run." Mr. Greensfelder, of the Hercules company, called attention to the fact that the Institute of Makers of Explosives had made a movie film combating the dangers resulting from children picking up caps and explosives. The film was interesting to children and rather entertaining.

Mr. Harrington Talks on Mine Fires

Metal-mine fires, said Daniel Harrington, chief engineer of the Bureau of Mines Safety Division, were increasing their toll of life and economic waste. A study of causes had revealed that of 55 fires in metal mines from 1917 to 1928, 12 were started by open lights, 6 by smokers, 22 by electricity, 2 by acetylene, 4 by friction, one each by slaked carbide, spontaneous combustion and lightning, and the origin of six fires was unknown.

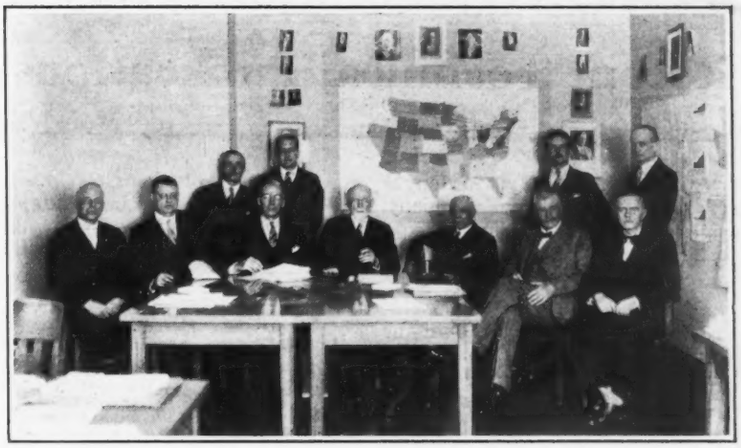
The Hollinger fire may have had any of many causes, said Mr. Harrington. It but emphasized what had been proved repeatedly, that a wet mine with wet timber was not immune from a disastrous fire. In fact, water would aid in leakage and grounding through timber, the speaker said, thus adding to the danger from electricity. A little rubbish, moreover, was dangerous. The combustion of a relatively small quantity would befoul the air of a mine so as to make it extinctive of human life.

Mr. Harrington expressed his opinion on various other matters also. Smoking should be forbidden, he thought. The danger of burning the insulation of conductors underground by an open light or an arc should not be overlooked. Electric machinery should never be set on wood foundations. Permissible explosives with electric detonators should be used instead of dynamite and fuse for blowing out timbers. It might be found necessary to imitate coal-mining practice, he said, and wet down sulphide ores before loading them, inasmuch as the dust was quite explosive. It might be advisable to use permissibles in shooting high-grade sulphide ore.

Metal-mine fires gave off fumes much worse than those resulting from coal-mine fires, Mr. Harrington said. The carbon dioxide and carbon monoxide percentages had been found to be higher. Methane also was generated in such fires. Men mending metal-mine fire stoppings with open lights had caused severe explosions. But where sulphur and arsenic were present, to these were added sulphur dioxide, hydrogen sulphide and arsenical fumes, the action of which even in small percentage was fatal.

Every mine should have mechanical ventilation with the fan at the surface and with provision for reversal of the current, but doors must not be expected to remain closed after such a reversal unless some definite system for holding them closed was provided. Many mines had a campaign planned for every situation, the rules of which should be memorized. These rules would not be followed, however, unless provision were made for frequent drills. In every main aircourse doors should be installed that would make isolation of parts of the mines readily possible. At many disasters a proper system of doors would have saved lives.

"No repair parts can be provided for the human being," said E. H. Suender, general manager of the Madeira Hill Company, Frackville, Pa. His topic was "The Management Believes in Accident Prevention." No manager can fail to feel the utmost responsibility for this loss, which bears heavily on both employee and employer, especially the former, he said. Among the causes of accidents was the failure to instruct employees as to the hazards of their occupation. E. Leland, general superintendent of the Moctezuma Copper Company (Phelps Dodge), said that his company had decreed that new workmen must pass an examination in safety after 60 days' employment.



Engineers Organize to Elect Hoover

THE accompanying illustration shows the executive committee of the Hoover-for-President Engineers' National Committee, which has an active branch in every state of the Union and in Hawaii. J. V. W. Reynders, builder of the Bear Mountain Bridge and chairman of the executive committee, is the fifth seated figure from the left. In the center of the seated group is James H. McGraw, president of the McGraw-Hill Publishing Company. Dr. Bain, secretary of the A.I.M.E., is at the right.

The executive committee includes (from left to right): Roy V. Wright, managing editor of *Railway Age;* N. A. Carle, consulting engineer, Newark, N. J.; F. D. Farish, secretary of the committee; Byron E. Eldred, engineer and inventor; J. A. Dewhurst, executive secretary of the committee; James H. McGraw, J. V. W. Reynders, chairman of the executive committee; Allen Hazen, G. W. Herron, and Samuel H. Dolbear, consulting engineers; and H. Foster Bain.

Recent Technical Publications

LABOR MANAGEMENT. By Gordon S. Watkins. A. W. Shaw Company, Chicago. Pages 720. Price $5.

Professor Watkins analyzes and interprets the principles of labor management in this book. Whatever solutions are forthcoming, he says, will be born of three important conditions, namely: (1) an intelligent understanding and scientific interpretation of the forces of evolution which have produced modern industrialism; (2) a scientific investigation of employment conditions which appear to be the basic causes of working-class revolt; and (3) the application of workable methods of improving employment relations. With this definite outline as a basis he proceeds to develop the subject-matter. The general problems are stated and the basic assumptions of enlightened personnel administration set forth. The succeeding parts take up in order the elements of human nature and the general principles of administrative science; they also present a description of the structure and function of the personnel department, a summary of the tasks and qualifications of the personnel manager, and, finally, discuss the sources of labor supply, the selection and placement of workers, and job analysis and specifications.

USE OF RESEARCH IN STANDARDIZATION AND SIMPLIFICATION. Policyholders' Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York, N. Y. 20 pages.

This pamphlet is the second of a series of reports on the application of research to production. Compelled to meet strenuous competition, New England manufacturers are said to be turning to research as a means to cutting costs and improving products. Machine-tool companies, paint manufacturers, and almost every industry in New England is making use of applied research to simplify and standardize its products and processes. A brief history of the accomplishment of 28 companies through this method is given in this booklet, which may be had free of charge.

FINDING AND STOPPING WASTE IN MODERN BOILER ROOMS. Third edition. Edited by George H. Gibson. Cochrane Corporation, Philadelphia. 804 pages. Price $3.

This volume is a reference book of text, tables, and charts compiled from papers read before engineering societies, books, articles in technical magazines, U. S. Bureau of Mines publications, and other sources and put into convenient form for those interested in boiler plant economy. It contains five sections on the subjects, respectively, of fuels, combustion, heat absorption, boiler efficiency and testing, and feed-water heating and conditioning. The last section discusses recent practice in heat balancing and the protection of the boiler and auxiliary equipment from scaling, embrittlement, and corrosion.

GEOPHYSICAL PROSPECTING—The second bulletin, Technical Paper 434, to be issued by the U. S. Bureau of Mines on this subject has made its appearance. A. S. Eve and D. A. Keyes, who produced Technical Paper 420 issued by the Bureau some months ago, are the authors of the present pamphlet, which, incidentally, contains 41 pages. In the earlier bulletin the writers gave a brief and elementary account of the principles involved in geophysical prospecting. As a next step and logical procedure it was thought advisable to verify by experiment some of the methods described, particularly by using electrical apparatus, which was simple, inexpensive, portable, and easy to obtain. An area was selected that was known to be especially suitable for detecting orebodies by electrical methods. The work, described in the present bulletin, consisted of making and comparing electrical surveys over this proving ground by as many methods as possible, rather than of searching for new orebodies in unknown territory, to quote from the opening paragraph of the bulletin. For the greater part of the experiment work the site chosen was on the northern slope of Caribou Mountain, near Nederland, Boulder County, Colo. The excellent electrical conductivity of the deposit (magnetite) rendered it particularly adaptable to electrical prospecting methods, and its strong magnetic properties enabled Dr. C. A. Heiland and J. A. Malkovsky, of the Colorado School of Mines, to make a highly accurate, independent magnetic survey with which the electrical surveys could be compared with confidence. In addition to making a magnetic survey, Dr. Heiland investigated the use of the torsion balance in this mountainous region. The magnetic and electrical surveys agreed satisfactorily in locating the orebody, it is said, and the various electrical surveys also gave concordant results. Although the seven electrical methods used all gave indication of the orebody, some were much more easily interpreted than others. The conclusion is reached by the authors that methods must be adapted to local conditions; that damp ground or ground underlain by springs may give misleading results; that the experimenters find further experiments desirable on certain phases of the subject. Finally, it is stated that simple, direct electrical methods of geophysical prospecting are available for judicious use by geologists and mining engineers. Experiments were also made on the penetration of radio waves into rock, indicating the probability that they can be received at depth exceeding 500 ft.

GEOPHYSICS—The September bulletin of the American Association of Petroleum Geologists contains an article on the subject of "Gravity Anomalies and Petroleum Exploration by the Gravitational Pendulum." The authors are M. K. Hubbert and Frank A. Melton.

ROUYN GEOLOGY—H. C. Cooke, of the Dominion Geological Survey, is the author of a paper entitled "Ore Relations at the Horne and Aldermac Mines, Quebec," which appears in the October issue of *The Canadian Mining and Metallurgical Bulletin.*

STRUCTURAL GEOLOGY—A short paper entitled "A Solution of Fault Problems" is to be presented at the annual western meeting of the Canadian Institute at Vancouver, in November. It is reprinted in the October issue of the Institute *Bulletin,* which, incidentally, is published at 923 Drummond Building, Montreal. The authors are G. Vibert Douglas and A. Vibert Douglas.

CANADA'S MINING INDUSTRY — The Mines Branch of the Dominion Bureau of Mines at Ottawa has issued four bulletins that have just come to hand. These are as follows:

"Investigation of Mineral Resources on the Mining Industry 1926." Bulletin 687; eighty pages.

"Investigation of Fuels and Fuel Testings (Testing and Research Laboratories), 1926." Bulletin 689; 132 pages.

"Investigations in Ore Dressing and Metallurgy (Testing and Research Laboratories), 1926." Bulletin 688; 134 pages.

"Annual Report of the Topographical Survey for the Fiscal Year Ended March 31, 1927." Price 10c. Thirty pages.

"Preliminary Report on the Mineral Production in Canada During the Six Months Ended June 30, 1928."

FLOTATION REAGENT—The properties and application of Aërofloat flotation reagent are covered in a bulletin, Technical Paper No. 12, issued by the American Cyanamid Company, 535 Fifth Ave., New York. This paper is intended as a supplement to the earlier papers on this reagent. In it is summarized the information collected by the company's representatives during their experience while introducing the reagent at various flotation plants throughout the world. Performance of the reagent under a great variety of conditions is set forth.

MINE SURVEYING—The same issue of the *Proceedings* of the Australasian Institute mentioned in the preceding paragraph contains a paper, by A. A. McLeod, entitled "A Convenient Method for Survey of Stopes and Development, as Practiced on North Broken Hill Ltd.'s British Mine." The method, according to the author, possesses great advantages of speed and simplicity of operation and calls for a minimum of equipment. The paper contains ten pages.

MARKET AND FINANCIAL NEWS

Another British Failure in Canadian Mining Development

THE London *Economist* of Sept. 29 comments as follows on the reported withdrawal of Consolidated Gold Fields of South Africa from the Canadian field:

"The unofficial announcement that the Consolidated Gold Fields of South Africa is closing down its organization in Canada will scarcely have come as a surprise to those who have followed the fortunes of its interests in that direction. The interests in question were dealt with through the Porcupine Goldfields Development & Finance Company, formed rather more than five years ago with a flourish of trumpets and a capital of £1,000,000 in £1 shares, whereof 250,000 were offered for public subscription at par. In August, 1925, the capital was scaled down by 12s. per share, and the following year fresh funds were raised by an issue of £100,000 in 8 per cent five-year notes.

One of the properties taken up—the Ankerite—was brought to the production stage, but did not long continue. In a recent issue a Canadian contemporary stated that encouraging indications had been obtained by diamond drilling, and that development would be based thereon. Some of the options which the company originally acquired were not exercised; numerous others since taken up have for the most part been allowed to lapse. Altogether, the degree of success achieved has not been such as to warrant the continuance of operations, and the shares are a nominal market at 1s. 6d. It may be that the decision of the Gold Fields board to quit Canada has some connection with the company's recent entry into Western Australia. At any rate, the policy of cutting losses is generally a wise one.

"Several wonderful mines have been discovered in Canada," concludes the *Economist;* "but, either by ill luck or bad judgment, British interests have generally managed to miss them."

Andes Copper Company Stock Offerings

DURING the last week, a limited number of shares of Andes Copper Company common stock was offered to the public by brokerage houses in New York. This stock is not a company offering, but constitutes a sale by private interests of stock secured through conversion of Andes 7 per cent convertible debenture bonds. The bond issue, totaling $40,000,000, was floated in 1925. The bonds are convertible into Andes Copper stock on the basis of 44 shares for each $1,000 in bonds any time before Jan. 1, 1943. Of the primary issue of 1,762,219 shares of stock, 99.87 per cent is owned or controlled by Anaconda Copper Mining Company.

Since the negotiations are of a semi-private nature, the company is unable to release detailed data as to the exact number of shares involved in the transaction. Andes recently paid its initial dividend of 75c. a share, payable Dec. 17, 1928, to stock of record Nov. 15, 1928.

Central Eureka Stock Collapses on San Francisco Exchange

CENTRAL Eureka's preferred stock, termed Class A and listed on the San Francisco Mining Exchange, dropped in price from a maximum of $6.37 to $2, on Sept. 27, 1928, in the short space of a few hours. The total issue of this stock is 200,000 shares. It was sold by the mining company to an underwriting syndicate for $1.25 per share and placed on the exchange at $2.50, where it increased in price until it reached $6.37 per share. Undoubtedly the market was manipulated, as there seemed no particular reason for an active demand at such prices. Optimistic accounts and various newspaper articles appeared at frequent intervals. High-pressure sales methods, it is said, forced stock sales at various places in the country.

Imports of White Arsenic Decrease

IMPORTS of white arsenic by the United States reached a peak in 1927, when 12,517 tons was received from foreign countries, an increase of almost 5,000 tons over 1926 and 2,500 tons higher than the record attained in 1923, while during the first seven months of 1928 they have been reported at 7,223 tons, which is 15 per cent lower than the amount entered during the corresponding period of 1927. Countries of origin were: Belgium, 396,527 lb.; Germany, 33,389 lb.; Canada, 3,695,485 lb.; Mexico, 18,749,460 lb.; Japan, 2,158,788 lb.; a total of 25,033,649 lb., valued at $921,998.

The greater part of the Canadian production of this commodity comes from the Province of Ontario, where it is obtained in the southern Ontario smelters as a byproduct in smelting silver-cobalt ores. The production of British Columbia is the next in importance. A small amount is produced likewise in Nova Scotia.

Bolivian Tin Production Higher, but Profits Decrease

TIN production in Bolivia for the first seven months of 1928 is more than 4,000 tons above production in the same period of 1927, according to figures made public recently by the Bolivian Consulate General. Despite the increase in production, the value of the product decreased more than $2,000,000. A government subsidy to miners in the form of lower tariffs on mining supplies has been necessitated by the drop in tin prices. Only by means of this governmental aid were the small producers of tin enabled to continue profitable operation.

In the face of this discouraging phase of the situation, statistics show that Bolivia apparently is moving into second place in world tin production. If production figures for the remainder of 1928 continue at the rate established in the first seven months, Bolivia will export more than 40,000 tons of tin during the year, compared with 33,858 tons last year. Recent rises in the price of tin in London and New York may be taken to indicate a more favorable condition, so that it is unlikely that production will fall off abnormally.

Production for the first seven months of 1928 was 25,000 long tons, valued at $17,648,449. Production for the first seven months of 1927 was over 20,000 long tons, with a value of $19,817,517. Tonnage figures are in terms of fine tin. With the exception of February, every month of this year has shown a tonnage increase over the corresponding month of 1927. With the single exception of March, the product of every month brought less than the amount brought by the corresponding month's product in 1927. Because of this situation, President Hernando Siles issued on April 23, 1928, a proclamation providing that as long as the price of tin remained below £280, the tariffs on mining necessities should be reduced 50 per cent. Those items, such as detonators, explosives, lumber, paraffin and mineral wax, and naphtha for tractors, come in large part from the United States.

NORTH LILY MINING COMPANY, operating in the East Tintic district, Utah, has declared an initial dividend of 20c. per share, payable Oct. 20, 1928, to stock of record Oct. 10, 1928. J. O. Elton, general manager of the Utah division of International Smelting, is president and manager of North Lily, which is controlled by Anaconda Copper.

Tin Interests London Metal Traders

New Developments in Iodine, Manganese, and Mercury Abroad Discussed

By W. A. Doman

London, Sept. 25, 1928.—Non-ferrous metals, with the exception of copper, have been decidedly dull, and lead prices have not been affected by last week's Lead Producers' Conference. Tin has undergone steady appreciation, closing yesterday at over £220, the highest for some months. The position of tin is one of extreme interest, in that the rise, although long expected, is not taken in certain quarters to mean the beginning of a sustained improvement in price, but is attributed by them to "bull" operations, and the taking off the market by "bull" interests of heavy tonnages on maturing contracts and options. The "bears," in explaining the situation, point to the existing backwardation of £5 as proof of their contention, but fail to account in this way for the corresponding activity which has been witnessed in New York. On the other hand there is the Anglo-Oriental group, and to it has been attributed the recent purchase of spot metal. It is rumored that this group has formed a strong syndicate in Paris with the object of taking an interest in this market, while the same principals are known to be negotiating an important consolidation of Malayan producers on the lines of that recently formed by them in Nigeria. Meanwhile, the shares of the principal producers are receiving much attention, and the general tone of both metal exchange and share market toward the metal is decidedly bullish.

The value of iodine to the Chilean nitrate industry was the subject of further discussion at last Friday's meeting of the British & South Pacific Trading Co., Ltd., when T. T. Aikman drew attention to the fact that sales of this by-product—which are controlled by a combination in which Chile has a quota of approximately 80 per cent—have amounted in the past to some 800 tons per annum. The profits which have accrued to the Chilean nitrate producers from iodine have been in the neighborhood of £1,000,000 per annum, or equivalent to 6d. to 8d. per metric quintal of nitrate produced. "Every effort is being made," said Mr. Aikman, "to extend the use of this commodity, and the experiments which have recently taken place in connection with its usage in petrol will, if confirmed, greatly increase its consumption."

Opinion is divided as to the chances of success of the South American Manganese Co., Ltd., which has been floated here this week with a capital of £150,000 to acquire and operate properties adjoining the Ouro Preto Gold Mines, in Minas Geraes State, Brazil. The report of Leon Gabriel, who is to act as manager, shows that a certain amount of development has been done, but no definite tonnages or values have been proved. An offer has been received by the company from "a powerful Continental house," of 11d. a unit for ore assaying 50 per cent metal, f.o.b. Rio de Janeiro. On this basis, 45/10 per ton, and with over-all costs estimated at 25/–, a profit of £52,000 is expected on a 50,000 ton annual output.

On the same subject of manganese, I learn that the Soviet Government has consigned a large tonnage of ore to Germany with a view to placing it, not only on the German market, but also on the British and French markets. This is the first attempt by the Soviet at direct foreign sales of manganese.

Prolonged negotiations between Italian and Spanish producers of mercury have, I understand, at last resulted in agreement concerning production. The Italian Government, as owners of the ex-Austrian mines of Idria, is a party to this agreement, while it is stated that the Spanish Government (which exploits the Almaden mines) has lent its support to a scheme for the establishment of a common sales organization. The price of mercury in London ranges between £24-5-0 and £24-10-0 per flask.

Imports and Exports of Ores and Metals in August, 1927 and 1928

Compiled from U. S. Department of Commerce Records

In Pounds, Unless Otherwise Stated

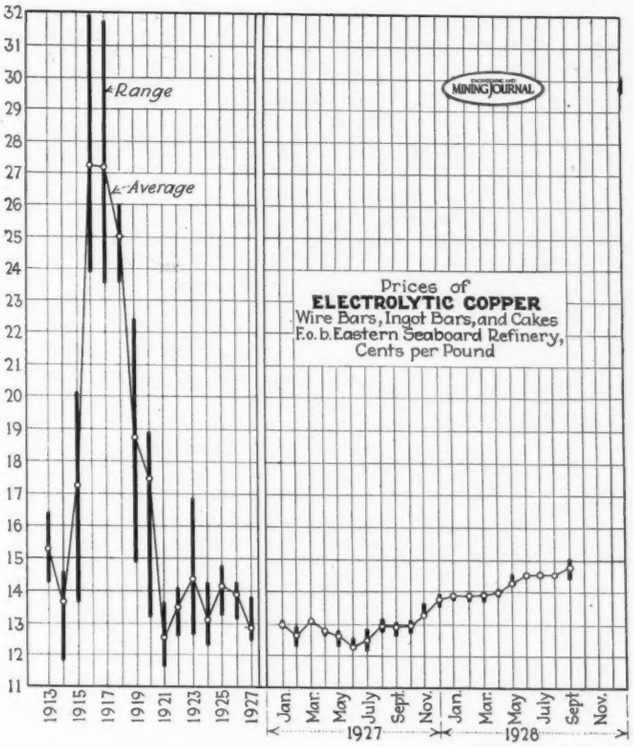
Imports

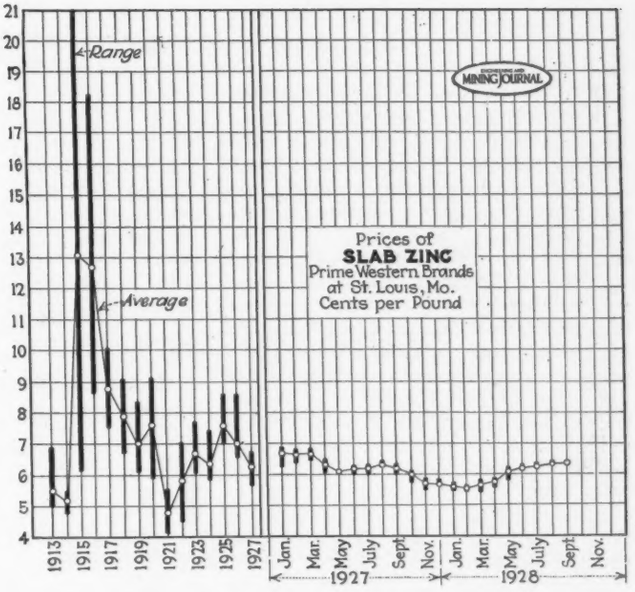
	August 1927	August 1928
Antimony		
Ore { Gross weight	84,220	326,700
Ore { Antimony content	51,130	153,200
Copper		
Ores, copper content	8,201,554	9,869,461
Concentrates, copper content	4,382,172	1,300,322
Regulus, coarse metal, cement copper	344,746	110,000
Imported from		
Spain	642,633	555,144
Canada	3,117,553	4,933,487
Mexico	2,234,574	1,455,937
Cuba	2,160,000	16,108
Chile	4,523,042	3,857,168
Peru	107,922	110,483
Other countries	142,748	351,456
Unrefined black converter copper in pigs, bars, and other forms	32,895,890	57,493,184
Refined copper	4,661,433	5,757,648
Old and clippings for remanufacture	701,910	650,279
Composition metal, copper chief value	.....	1,000
Brass, old, for remanufacture	496,235	884,864
Lead		
Ore and matte, lead content	7,351,855	4,265,911
Bullion or base bullion	29,144,666	19,132,884
Pigs and bars	457,240	100
Babbitt, solder and other forms, lead content	72,431	67,592
Type metal, antimonial lead { Gross weight	56,664	447,028
Type metal, antimonial lead { Lead content	35,699	321,330
Manganese, tons		
Cuba, manganese content	92	104
Other countries, manganese content	22,964	25,996
Pyrites, tons	28,583	36,889
Tin		
Ore, tons	11	12
Bars, blocks, pigs	13,174,412	748,983
Imported from		
Netherlands	2,349,584	1,737,766
United Kingdom	4,130,946	3 100 867
British Malaya	12 075,916	9,365,866
China and Hongkong	347,174	.....
Australia	78,400	185,920
Other countries	192,392	358,564
Zinc		
Ore, zinc content { Free, less 10 per cent zinc	1,400	.....
Ore, zinc content { Dutiable	1,848,072	208,031
Blocks, pigs and old	1,020	.....

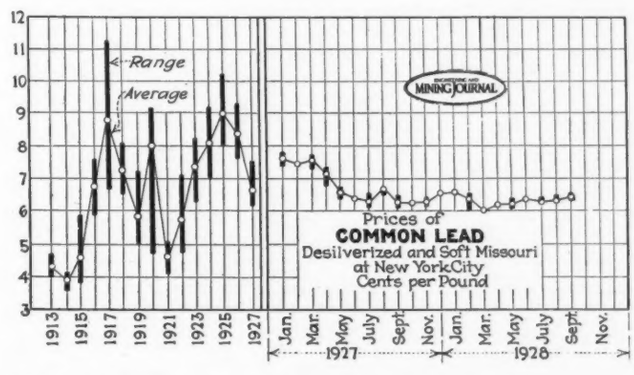
Exports

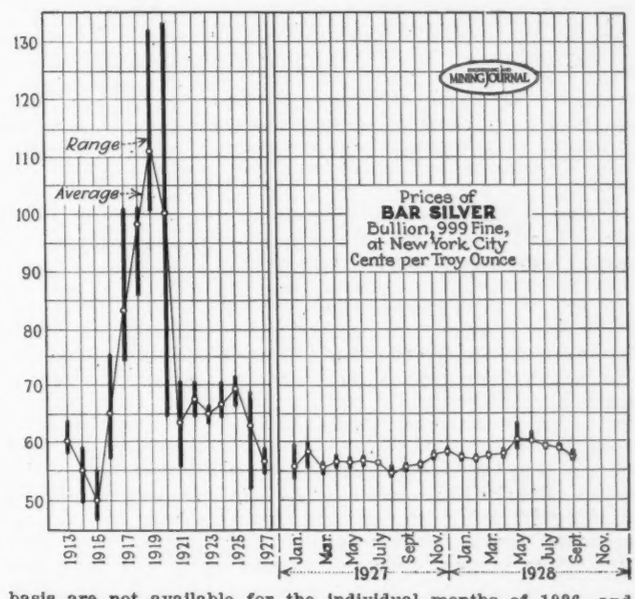
	August 1927	August 1928
Copper		
Ores, composition, concentrates, unrefined	528,464	424,712
Refined copper in ingots and other forms	84,339,780	72,409,462
Exported to		
Belgium	9,047,347	4,519,595
France	8,415,525	14,735,273
Germany	21,481,339	16,034,562
Italy	6,045,671	10,200,044
Netherlands	8,708,766	4,032,238
Spain	78,668	392,126
Sweden	2,694,000	3,217,627
United Kingdom	16,158,910	16,432,458
Other Europe	4,531,459	398,684
Canada	2,015,778	976,472
China, Hongkong, Kwantung	1,209,600	57,800
Japan	3,191,430	1,175,790
Other countries	761,287	236,793
Old and scrap	3,262,671	3,530,636
Pipes and tubes	381,140	271,786
Plates and sheets	485,145	603,751
Rods	3,741,706	4,699,439
Insulated copper wire and cable	2,061,623	1,705,676
Lead		
In pigs, bars and other forms	29,413,935	17,064,405
From domestic ore	1,036,279	1,478,376
From foreign ore	28,377,656	15,586,029
Exported to		
Belgium	134,443	.....
France	784,180	224,064
Germany	10,810,856	5,456,008
Netherlands	1,803,623	291,349
Sweden	952,254	560,432
United Kingdom	7,730,227	5,915,633
Other Europe	1,288,970	616,246
Brazil	224,041	240,844
Other South America	1,436,779	71,207
China, Hongkong, Kwantung	1,120,861	.....
Japan	2,913,319	3,647,982
Other countries	214,382	40,640
Other lead manufactures	681,489	678,365
Zinc		
Ores and concentrates, tons	3,629	116
Dross	1,603,807	665,797
Cast in slabs, blocks, and pigs	10,341,948	5,846,121
Exported to		
Belgium	56,000	.....
France	582,491	784,221
Germany	3,501	351,095
Netherlands	.....	1,921
United Kingdom	6,480,933	.....
Other Europe	.....	191,159
Argentina	897,787	.....
Japan	1,232,212	4,480,362
Other countries	1,089,024	37,363
Sheets and strips, other forms	637,722	654,083
Dust	261,090	75,817
Other zinc manufactures	407,467	140,793

Metal Price Curves

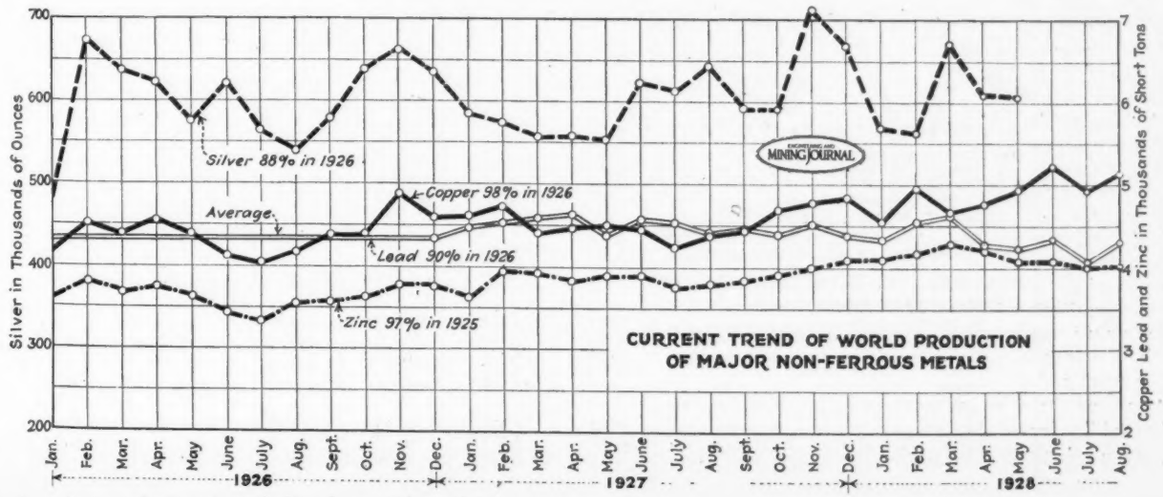








THE CURVES below are not to be considered as permanent records of production. They show merely the current trend in terms of daily output according to the latest estimates of the American Bureau of Metal Statistics. The figures represent production from countries that produce approximately 98 per cent of the world's copper, 97 per cent of the zinc, 90 per cent of the lead, and 88 per cent of the silver. The figures for lead on the new basis are not available for the individual months of 1926, and accordingly to horizontal line showing the monthly average reduced to a daily rate is shown. Delay in receipt of statistics from Mexico accounts for the failure of the silver curve to be up to date.



Review of Current Statistics

By Homar L. Johnson
Assistant Editor

HIGHER prices for copper and lead in September occasioned an advance in *E. & M. J.'s* Weighted Index of Non-Ferrous Metal Prices, despite a decline in the price of silver and virtually unchanged quotations for tin, zinc, aluminum, and nickel. An outstanding statistical feature of the month was the tremendous volume of copper sold on foreign and domestic account. A conservative estimate places the total at 250,000 tons, which is comparable with an approximate monthly average figure for 1927 of 111,000 tons. Admitting that a higher rate of production is prevailing this year, nevertheless these figures indicate that the September sales total was at least twice that of a normal month. Just what explanation would reveal the reasons for the great buying activity of last month is a moot question. Undoubtedly the key to the entire situation is the increased consumptive demand. Buying psychology is difficult to analyze, however, though it is evident that the spirit of buying is infectious, particularly if a price advance is feared, and a period of comparative inactivity is almost certain to be followed by a "buying wave."

Sales of lead were in large volume also. Lead was forced to take a position of secondary market importance only because of the unusual activity in copper. The sustained high rate of automobile productive operations, which has resulted in greater lead demand for battery manufacture, together with the volume of buying by cable makers, has served to surround the lead market with a greater spirit of optimism than it has seen in some time. Silver prices sloughed off considerably last month with the return of more tranquil conditions in the Far East, but fair stability at current levels is indicated. Tin was fractionally higher owing to a spurt in London, though the advance was insufficient to affect the weighted index.

All three of *E. & M. J.'s* Weighted Indexes of Common Share Stock Market Valuations advanced. The smelting group and the copper group indexes continued their advances into new high and previously unexplored regions — with the mining-smelting-manufacturing index the advance may properly be designated as into "uncharted" regions, as a glance at the graph on page 597 will reveal. Recent advances in share quotations of Anaconda have carried its stock-market valuation nearly to the $250,000,000 mark. International Nickel, which was the subject of many pages of financial copy when the investing public boosted its stock-market valuation above $100,000,000 late in the spring of 1927, has added another chapter to its remarkable financial history by passing well over the $200,000,000 mark of stock-market valuations. The fact that even with the recent increase in dividend rate the yield is only about 2 per cent, indicates how much the speculative public is discounting future earnings from recent discoveries. Of the other five companies included in the index, New Jersey Zinc, U. S. Smelting, and American Metal share quotations were higher, whereas National Lead and A. S. & R. quotations were lower than in the preceding month.

E.&M.J. Weighted Index of Non-Ferrous Metal Prices

100 Is Composite for 1922-3-4

1920	130.92
1921	80.80
1922	93.94
1923	103.43
1924	102.63
1925	111.74
1926	107.74
1927	97.54

	1926	1927	1928
February	111.91	100.01	96.73
March	108.95	100.84	96.22
April	105.93	98.63	97.14
May	105.43	96.41	99.05
June	106.68	95.55	100.16
July	109.08	95.42	99.69
August	110.22	97.25	99.85
September	109.27	96.01	100.53

A further advance in the copper-group index number during September was to be expected in view of the splendid condition of the copper market. Eleven of the fourteen companies included in the indexes recorded appreciation in share valuation. In order of influence on the weighted composite the companies to advance were Kennecott, New Cornelia, Calumet & Hecla, Calumet & Arizona, Inspiration, Chile, Granby Consolidated, United Verde Extension, Magma, Miami, and Nevada Consolidated. Old Dominion, Quincy, and Copper Range quotations declined in value.

The advance in the index number of the share valuation of thirteen miscellaneous mining companies was accounted for in large part by the two copper-producing members of the group, Cerro de Pasco and Howe Sound. Cerro de Pasco as the result of recent advances in share quotations is a new addition to the $100,000,000 stock-market valuation family. St. Joe Lead contributed a 2⅝ point advance, but except for relatively insignificant appreciations by Federal M. & S. and Utah-Apex the general tendency was downward, with Hollinger setting the pace—a condition that has become chronic of late. Lake Shore, Premier Gold, Homestake, Cresson, Hecla, and Silver King Coalition registered lesser declines, and September quotations for Tintic Standard were unchanged from those for the preceding month.

Metal production statistics for August, the latest available, show a decisive upturn after the customary July slump. North and South American production of refined copper established a new record. The daily rate for August—4,631 tons—exceeds that of February, 1927, the previous record month by 233 tons, roughly 5 per cent, and is nearly 15 per cent above the 1927 monthly average. Domestic deliveries totaled 83,398 tons in August, surpassing the previous high mark by more than 1,100 tons. North and South American refinery production for the first eight months of 1928 averaged 4,255 tons per day, which exceeds the 1927 monthly average by 210 tons per day—more than 5 per cent. That this increase has been warranted — more than warranted, in fact — by an increase in consumption is indicated by a decline in total stocks of blister and refined in the first eight months of 1928, amounting to 34,492 tons.

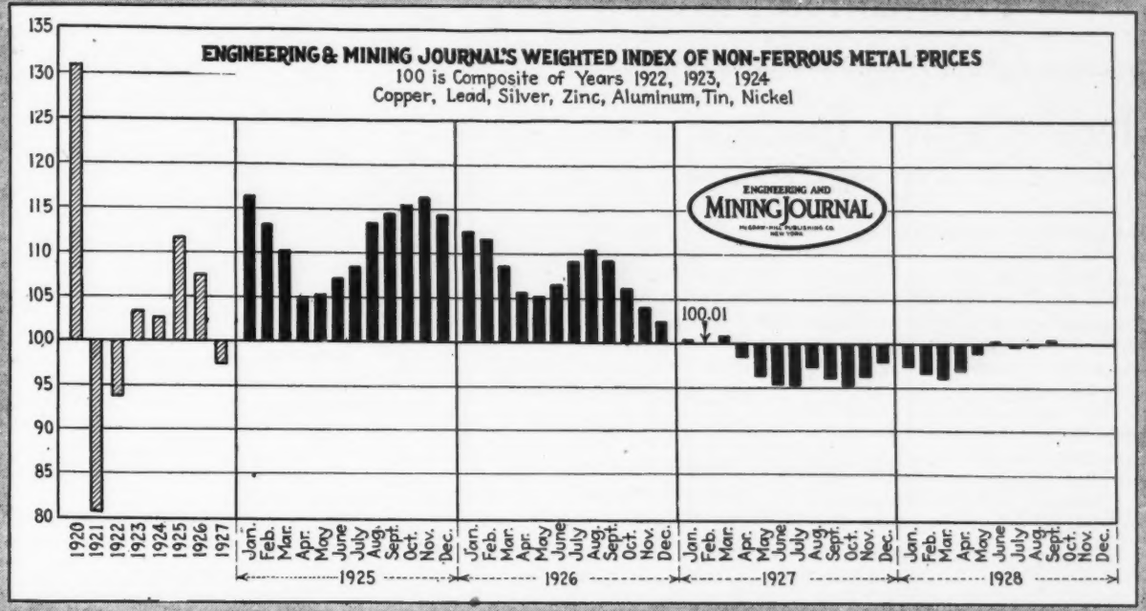
Current Statistics of Production and Stocks of Copper, Lead and Zinc

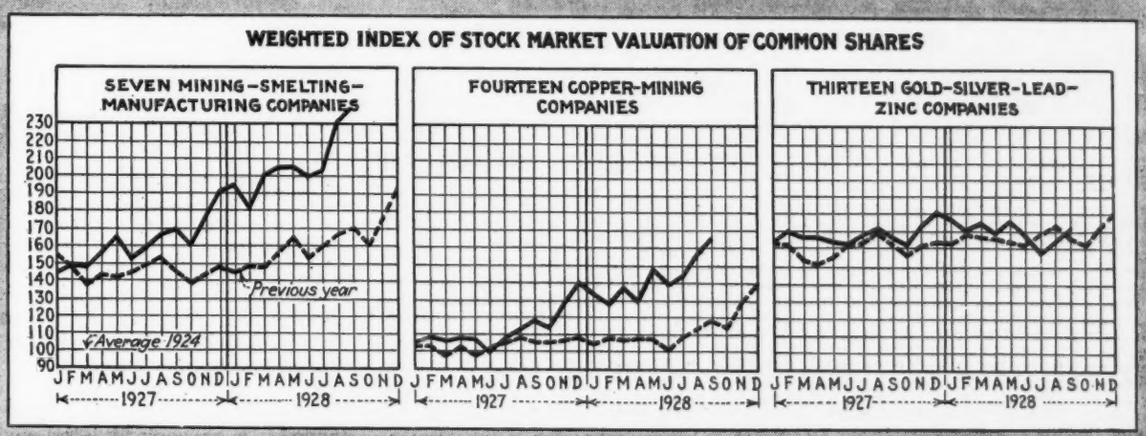
Data from American Bureau of Metal Statistics

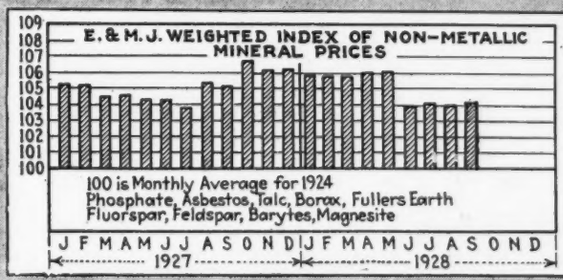
Figures Represent Short Tons

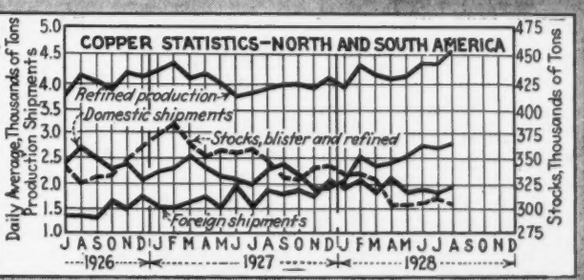
	1927	1928			
	Average	August	June	July	August
COPPER—North and South America					
Production, refined, daily average	4,045	3,884	4,367	4,358	4,631
Domestic shipments	68,737	71,736	81,436	82,245	83,398
Foreign shipments	53,489	58,784	57,067	56,785	60,240
Stocks, blister and refined	351,611	347,072	310,503	312,544	309,226
LEAD—United States and Mexico					
Production, smelter, daily average	2,513	2,577	2,470	2,219	2,429
Production, U. S. mines, daily average	1,798	1,822	1,717	1,570	1,742
Imports into U. S. A.	13,451	18,477	14,503	14,272	.....
Stocks, smelter and refinery	156,878	162,866	163,709	158,919	156,976
ZINC—United States					
Production, daily average	1,681	1,581	1,694	1,642	1,682
Domestic deliveries	45,811	49,739	49,780	49,510	47,050
Exports, slab zinc	3,468	4,807	1,709	2,145	.....
Exports, ores and dross	4,424	4,867	268	221	.....
Stocks	37,602	34,587	44,468	42,210	44,416
World Production Rate (Daily average)					
Copper	4,543	4,355	5,215	4,942	5,124
Lead	4,514	4,380	4,443	4,170	4,350
Zinc	3,910	3,803	4,131	4,013	4,027

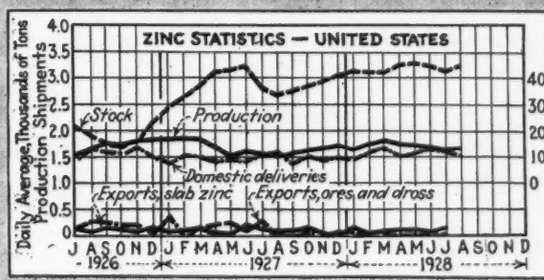
E.&M.J. Statistics of the Mining Industries

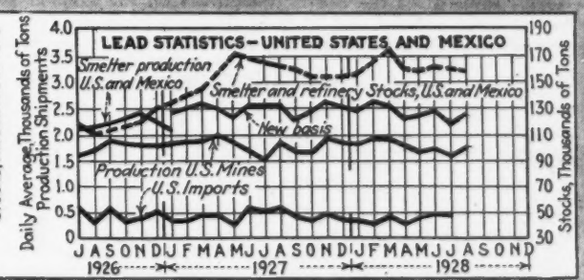





E. & M. J. WEIGHTED INDEX OF NON-METALLIC MINERAL PRICES
100 is Monthly Average for 1924
Phosphate, Asbestos, Talc, Borax, Fullers Earth
Fluorspar, Feldspar, Barytes, Magnesite
1927
1928







The Market Report

Metal Markets Inactive—No Change in Prices

New York, Oct. 10, 1928—The exceptional demand for lead and copper which has dominated the metal markets in recent weeks has subsided, and business consummated during the week ending today is considerably less than average in volume. Copper is very quiet, and a large proportion of the business done has been in relatively small lots. Lead sales have been well below average, and demand for zinc has been comparatively light. Prices, however, are unchanged, and the producers are well fortified for a considerable period of inactivity by their recent extensive sales. Silver advanced fractionally during the week, whereas tin and quicksilver prices are somewhat easier.

Daily Prices of Metals

Oct.	Electrolytic Copper	Straits Tin	Lead		Zinc
	Refinery	New York	New York	St. Louis	St. Louis
4	15.025	49.375	6.50	6.30@6.325	6.25
5	15.025	49.00	6.50	6.30@6.325	6.25
6	15.025	49.00	6.50	6.30@6.325	6.25
8	15.025	48.75	6.50	6.325	6.25
9	15.025	48.625	6.50	6.30@6.35	6.25
10	15.025	48.625	6.50	6.30@6.325	6.25
	15.025	48.896	6.500	6.317	6.250

Average prices for calendar week ending October 6, 1928, are: Copper, 15.025; Straits tin, 49.417; N. Y. lead, 6.500; St. Louis lead, 6.319; zinc, 6.250; and silver, 57.917.

The above quotations are our appraisal of the major markets for domestic consumption based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

Copper, lead, and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

In the trade, copper prices usually are quoted on a delivered basis: that is, delivered at consumer's plant. As delivery and interest charges vary with the destination, the figures shown above are net prices at refineries on the Atlantic seaboard. Delivered prices in New England average 0.225c. per pound above those quoted.

Quotations for copper are for the ordinary form of wire bars and ingot bars. For ingots an extra 0.05c. per pound is charged; for slabs, 0.075c.; and for cakes, 0.125c. up, depending on weight. Cathodes are sold at a discount of 0.125c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York is now quoted at 0.35c. per pound above St. Louis, this being the freight rate between the two points.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

Oct.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3M	Spot	3M	Spot	3M
	Spot	3M							
4	64 9/16	65	71 1/4	222 1/2	220 3/4	21 15/16	21 3/4	24	24 1/4
5	64 13/16	65 9/16	71 1/4	218 5/8	217 3/8	22	21 3/4	24	24 1/4
8	64 5/8	65	71 1/4	218 3/4	216 3/4	22	21 3/4	23 7/8	24 3/16
9	64 11/16	65 1/8	71 1/4	218 3/4	216 1/2	22 1/8	21 7/8	24	24 5/16
10	64 11/16	65 1/8	71 1/4	220 3/4	217 3/4	22 1/16	21 13/16	24	24 1/4

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Oct.	Sterling Exchange "Checks"	Silver		Gold London	Oct.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
4	4.84 1/2	58 1/8	26 11/16	84s11 1/2d	8	4.84 5/8	58 1/2	26 15/16	84s11 1/2d
5	4.84 7/16	58	26 3/4	84s11 1/2d	9	4.84 5/8	58 3/4	27	84s11d
6	4.84 1/2	58 1/8	26 3/4	.....	10	4.84 3/4	58 1/2	26 15/16	84s11 1/2d
					Ave.		58.333		

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command three-eighths cent premium.

Copper Continues Quiet

Sales of copper during the week ending today were little more than 50 per cent of normal. The total for the week was almost a duplication of that reported for the preceding week. Sales of small lots, in a number of instances for reasonably early delivery, have predominated. Demand for automobile production has been a feature of sales of this type. On most of the larger orders, November and early December delivery has been designated. Considerable inquiry for January metal was reported by various sellers, but in only one instance was delivery that far in advance agreed upon. Export business has been in normal volume, though some factors in the trade are inclined to believe that October and November requirements of Continental consumers are in large part unprovided for. With operations in the various districts in the West speeded up to permit increased production, employment at a high rate, and with the recent wage advances in effect, conditions at the copper mines are beginning to reflect the improved situation of the copper market in recent months. Copper Exporters, Inc., maintain their price at 15½c. per pound c.i.f. usual European destinations.

Lead Demand Moderate

After four weeks of better than average business, the lead market this week has been perceptibly quieter, though most sellers have done a fair amount of business and are well satisfied with their sales position. The indications are that October will see a further inroad into the stocks held by producers, even though the market shows no particular activity during the remainder of the month. Consumption by cable manufacturers is particularly large, and much of the business in the current week has been for their account. Battery makers have also been in the market, again reflecting the continued heavy demand for batteries for the new automobiles that are being built in record quantities for this time of the year.

New York prices continue at the contract level of the American Smelting & Refining Company, 6.50c., at which all business in the East seems to be based unless special brands are desired. The larger producers in the Middle West also quote unchanged prices of 6.325c. for early deliveries, one seller getting 6.35c. for a substantial tonnage for December shipment yesterday. One or more of the smaller sellers, on the other hand, meeting increased difficulty in marketing their offerings, have offered lead for October shipments at 6.30c., and enough has been sold at that level to warrant consideration in arriving at average prices.

The foreign lead market has been rather quieter, and the London price seems pretty well stabilized around £22. It has not been below £21⅝ nor higher than £22¾ since the middle of August.

Zinc Very Dull

The zinc market experienced one of the quietest periods of the year in the week ending today, though the price remains unchanged at 6.25c. per pound East St. Louis. Rumors continue to be heard, on all sides, of metal available at 6.225c. per pound, but thus far such transactions, if they have been consummated, have been negotiated well under cover. Recent unfavorable statistics are undoubtedly responsible for much of the buying reticence.

The August statistics of the American Zinc Institute follow, figures being in tons of 2,000 lb.:

Stock, Sept. 1	44,416
Produced	49,361
Total	93,777
Shipped	45,862
Stock, Sept. 30	47,915
Shipped from plants for export	1,759
Metal sold, not yet delivered, Sept. 30	19,092
Total retort capacity, Sept. 30.	116,136
Average number of retorts operating in September	65,312
Number of retorts operating Sept. 30	61,965

Little Interest in Tin

Tin has shared the quietness of the other metals this week, neither consumers nor dealers taking much part in the market. The tightness in London seems to be abating gradually, confirming the opinion that it was largely artificial. In the domestic market, a drop of about 1c. for the week has occurred. Sometimes in the past, such a drop would bring out considerable buying by consumers, but it has not done so up to the present, and the tendency still seems downward.

Futures are quoted at about ⅜c. less than spot. There is virtually no market for the 99 per cent grade.

Silver Higher

The silver market was active last week, the price advancing steadily to Oct. 9, when 58¾c. was quoted locally. This activity was caused by good buying for India and China account.

Mexican Dollars (Old Mexican pesos): Oct. 4th, 44c.; 5th, 43⅞c.; 6th. 44c.; 8th, 44⅛c.; 9th, 44⅛c.; 10th, 44⅝c.

Foreign Exchanges Firmer

The important foreign exchanges have been somewhat stronger the last day or two. A slight advance in sterling probably precludes further shipments of gold from London for the time being. Closing cable quotations on Tuesday, Oct. 9, were as follows: Francs, 3.90⅛c.; lire, 5.23⅞c.; and marks, 23.795c. Canadian dollars, par.

Other Metals

Quotations cover large wholesale lots unless otherwise specified

ALUMINUM—Per lb., 99 per cent plus grades, price of leading interest, 24.30c. Outside market, 99 per cent plus, 24.30c.; 98-99 per cent, 23.90c.

ANTIMONY—Per lb., duty paid, New York: Chinese brands, 11⅜c. per lb. for spot, 11⅛@10⅞c. per lb. for futures. Cookson's "C" grade, spot, 15⅜c.

BISMUTH—Per lb., New York, in ton lots, $1.70. Smaller lots, $1.85 and up.

CADMIUM — Per lb., New York: 70@80c. Demand is active but producers have variable ideas as to price.

IRIDIUM — Per oz., $280@$300 for 98@99 per cent sponge and powder.

NICKEL—Per lb. ingot, 35c.; shot, 36c.; electrolytic, 37c. (99.9 per cent grade) for single lots of spot metal.

PALLADIUM — Per oz., $42@$46. Small lots bring up to $50. Nominal.

PLATINUM—Official price quoted by the leading interest on small miscellaneous orders for refined metal, per oz., $78. Dealers and refiners quote the trade for refined metal, per oz., cash, for wholesale lots, $73.50@$74 bid, $75@$76 asked. Quiet.

QUICKSILVER — Per 76-lb. flask, $127 to $128, cash. Small lots command the usual premiums. San Francisco wires $133.

Prices of Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tantalum, Tellurium, Thallium, Tungsten, and Zirconium are unchanged from the issue of Oct. 6.

Metallic Ores

TUNGSTEN ORE—Per unit of WO_3, N. Y.; Wolframite, $10.85; Western scheelite, nominal.

Chrome, Iron, Manganese, Tantalum, and Titanium ores are unchanged from quotations in the Oct. 6 issue.

Slight Increase in Tri-State Production

Joplin, Mo., Oct. 5, 1928

Blende	Per Ton
High	$42.50
Premium blende, basis 60 per cent zinc	40.00@41.00
Prime Western, basis 60 per cent zinc	40.00
Fines and slimes, 60 per cent zinc	36.00@39.00
Average settling price, all zinc	39.87
Galena	
High	$86.20
Basis 80 per cent lead	85.00
Average settling price, all lead	84.17

Shipments for the week: Blende, 8,883; lead, 2,144 tons. Value, all ores the week, $534,830.

The shipment of zinc concentrate was increased 2,880 tons, and the production was increased 230 tons, compared with the preceding week. The Eagle-Picher Lead Company is to close down two blocks of its Henryetta zinc smelter for an indefinite period. The company's production of concentrates is being largely absorbed by other smelting companies.

Platteville, Wis., Oct. 6, 1928.

Zinc Blende	Per Ton
Blende, basis 60 per cent	$42.75
Lead Ore	
Lead, basis 80 per cent	$86.00

Shipments for the week: Blende, 818 tons; lead, 80 tons. Shipments for the year: Blende, 28,724 tons; lead, 1,570 tons. Shipments for the week to separating plants, 1,163 tons blende.

Non-Metallic Minerals

Amblygonite, Asbestos, Barytes, Bauxite, Borax, Celestite, Chalk, China Clay, Diatomite, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Iron Oxide, Lepidolite, Limestone, Magnesite, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystal, Silica, Spodumene, Sulphur, Talc, and Tripoli are unchanged from prices in the Oct. 6 issue.

Metallic Compounds

ARSENIOUS OXIDE (White Arsenic) —Per lb., 4c. Demand continues fairly good with much of it coming from glass manufacturers.

Antimony Oxide, Calcium Molybdate, Copper Sulphate, Sodium Sulphate (Salt Cake), Sodium Nitrate, and Zinc Oxide are unchanged from prices in the Oct. 6 issue.

Alloys

FERROMANGANESE—Per long ton, domestic and foreign, f.o.b. furnace or duty paid, port of entry, $105 quoted for last half, 1928. Spiegeleisen, 19@21 per cent, $33 f.o.b. furnace.

Ferrocerium, Ferrochrome, Ferromolybdenum, Ferrophosphorus, Ferrosilicon. Ferrotitanium, Ferrotungsten, Ferrovanadium, Monel Metal, Nickel Silver, and Yellow (Muntz) Metal are unchanged from prices in the Oct. 6 issue.

Rolled Metals

Copper, Lead, and Zinc Sheets are unchanged from prices in the Oct. 6 issue.

Refractories

Chrome Brick, Fireclay Brick, Magnesite Brick, Silica Brick and Zirkite are unchanged from quotations in the issue of Oct. 6.

Iron, Steel, and Coke

Iron—Per gross ton, Valley furnaces, Bessemer, $17.25@$17.50; basic, $16.50 @$17; No. 2 foundry, $17.

Steel—Base prices per gross ton, Pittsburgh, billets and slabs, $33@$34; plates, structural shapes, and soft steel bars, per lb., 1.90@2c.

Coke — Per gross ton, Connellsville furnace, $2.75@$3. Connellsville foundry, $3.75@$4.85. By-product coke, Ohio and Kentucky, $7; Buffalo and Detroit, $8.50@$9.

Mining Stocks—Week Ended October 6, 1928

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	84	79⅛	82	Oc.13, No. 19 Q	1.00
Ariz. Com'l	Boston	5⅛	5	5⅛	Jl. 16, Jl. 31 SA	0.25
Cal. & Ariz	New York	116½	110	111½	Se. 7, Se. 24 Q	1.50
Calumet & Hecla	Boston	34	32	32	Au. 31, Se. 15 Q	0.50
Cerro de Pasco	New York	99½	96	96⅛	Oc.11, No. 1 Q	1.25
Chile Copper	New York	53	50⅛	51⅛	Se.15 Se.29 Q	0.62½
Con. Coppermines	N. Y. Curb	11⅛	11⅛	11⅛		
Copper Range	Boston	22⅛	21	21⅛	Mr. 24, Ap. 20 A	1.00
Crystal Copper	Boston Curb	*28	*27	*27		
East Butte	Boston	3⅛	3	3⅛	Dec., 1919	0.50
Granby Consol	New York	68⅛	65	65	Oc.11, No.1 Q	1.00
Greene Cananea	New York	130⅛	121½	124½	Se. 14, Oc.1 Q	1.00
Howe Sound	New York	67	63	64	Se 29, Oc.15, Q	1.00
Inspiration Consol	New York	20⅛	26½	26⅛	Apr. 1927 Q	0.25
Isle Royale	Boston	22	21	21	Au.31, Se.15 SA	0.75
Kennecott	New York	102⅛	99⅛	99⅛	Au.31, Oc 1 Q	1.50
Magma Copper	New York	60⅛	58	58	Oc.1, Oc.15 Q	0.75
Mason Valley	N. Y. Curb	2	1⅛	1⅛		
Miami Copper	New York	24⅛	23	23	No.1, No.15, Q	0.37½
Mohawk	Boston	48⅛	46	47⅛	Oc. 31, De. 1	3.00
Montana-Idaho	Spokane	*11½	*10⅛	*11⅛		
Mother Lode Coal	New York	3⅛	3⅛	3⅛	Je.8, Je. 30, SA	0.15
Nevada Consol	New York	27⅛	26½	27	Se.14, Se.29 Q	0.37½
New Cornelia	Boston	33⅛	32½	32⅛	Au.3, Au. 20 Q	0.50
Noranda	N. Y. Curb	51⅛	45	48⅛		
North Butte	Boston	5⅛	5	5⅛	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	*80	*75	*75	Sept., 1926	0.03
Old Dominion	Boston	15⅛	15	15⅛	Dec., 1918	1.00
Phelps Dodge	N. Y. Curb	182	175	175	Se.10, Oc.1 Q	2.00
Quincy	Boston	39⅛	37	38⅛	March, 1920	1.00
St. Mary's Min. Ld	Boston	34⅛	31	32⅛	Ap.1928 A	2.00
Seneca Copper	New York	4	3⅛	3⅛		
Shattuck-Denn	N. Y. Curb	20	18⅛	18⅛		
Tenn. C. & C	New York	16⅛	15⅛	15⅛	Au., 31 Se.15,Q	0.25
United Verde Ex	N. Y. Curb	16⅛	16	16⅛	Oc.6, No.1 Q	0.50
Utah Copper	New York			174	Se.14, Se.29 Q	2.00
Utah Metal & T	Boston	1⅛	1⅛	1⅛	Dec., 1917	0.30
Walker Mining	Salt Lake	1.87½	1.75	1.75		
NICKEL-COPPER						
Internat. Nickel	New York	140⅛	123½	139⅛	Se.10, Se.29 Q	0.75
Internat. Nickel pfd	New York			115	Oc.1, No.1 Q	1.50
LEAD						
Gladstone Mtn	Spokane	*6	*4⅛	*6	June, 1927	0.005
National Lead	New York	124	123	124	Se.14, Se.29 Q	1.25
National Lead, pfd. A	New York	142	142	142	Au.31, Se.15 Q	1.75
National Lead, pfd. B	New York	119	119	119	Oc. 19, No.1 Q	1.50
St. Joseph Lead	New York	47⅛	44	45⅛	Se.8, De.20 QX	0.75
ZINC						
Am. Z. L. & S	New York	55⅛	43	52	May, 1917	1.00
Am. Z. L. & S. pfd	New York	97⅛	93⅛	97⅛	Nov., 1920	1.50
Butte C. & Z	New York	8	7⅛	7⅛	De., 1926	0.50
Butte & Superior	New York	11⅛	10⅛	10⅛	Se.14,Se.29 Q	0.50
Callahan Zn-Ld	New York	3⅛	3	3⅛	De., 1920	0.50
Consol.Lead&Zinc 'A'	St. Louis	12	12	12	Je.25, Jl.1 Q	0.25
Eagle-Picher	Cincinnati	19⅛	18⅛	18⅛	No.15, De.1 Q	0.40
Eagle-Picher pfd	Cincinnati			100	July 15 Q	1.50
Evans-Wallower	N. Y. Curb	7⅛	7	7⅛		
New Jersey Zn	N. Y. Curb	226	224⅛	225⅛	Oc.20, Nov. 10 Q	2.00
Treadwell-Yukon	Toronto	14	11½	11½		
United Zinc	N. Y. Curb	*60	*60	*60		
Yellow Pine	Los Angeles	*25	*25	*25	Dec., 1925 QX	0.04
GOLD						
Alaska Juneau	New York	4⅛	4⅛	4⅛		
Ankerite	Toronto	*28	*28	*28		
Barry-Hollinger	Toronto	*50	*45⅛	*47⅛		
Central Manitoba	Toronto	*93	*85	*85		
Cresson Consol. G	N. Y. Curb	*94	*80	*82	Je.30, Jl.10 Q	0.10
Dome Mines	New York	9	8⅛	8⅛	Se.29, Oc.20 Q	0.25
Gold Hill	Toronto	*12	*9	*10		
Golden Cycle	Colo.Springs	†1.65	†1.63⅛		My. 31, Je.10 Q	0.04
Hollinger Consol	Toronto	8.30	7.00	7.60	Se 19, Oc.6 FW	0.05
Homestake Mining	New York			74	Oc.20, Oc. 25 M	0.50
Kirkland Lake	Toronto	1.50	1.24	1.25		
Lake Shore	Toronto	22.15	21.00	21.50	Se.1, Se.15, QX	0.20
McIntyre Porcupine	New York	21	20	20	Au.1, Se.1 Q	0.25
Portland	Colo.Springs	†*19	†*14		Ap., 1927	0.02
Rand Mines	New York	40	40	40	Au.21-28 Am.Sh	1.52
Sylvanite	Toronto	2.75	2.55	2.75		
Teck-Hughes	Toronto	9.10	8.50	8.55	Oc.18, Oc.31	0.15
Tom Reed	Los Angeles	*58	*51	*52	Dec., 1926	0.02
Tough-Oakes	Toronto	*37	*26	*27		
Vipond Cons	Toronto	*59	*53	*53	April, 1927 Q	0.03
Wright-Hargreaves	Toronto	2.95	2.50	2.50	Jl.16, Au.1 Q	0.02½
GOLD AND SILVER						
Carnegie Metals	N. Y. Curb	20⅛	19⅛	20⅛		
Con. Cortes	N. Y. Curb			*19		
Dolores Esperansa	N. Y. Curb	*99	*90	*95	July, 1923	0.05
N.Y. Hond's Rosario	N. Y. Curb	15	14⅛	14⅛	Jl.18, Oc.28 Q	0.50
Premier Gold	N. Y. Curb	2 3/16	2 3/16	2 3/16	Se.14, Oc.4 Q	0.06
Tonopah Belmont	N. Y. Curb	*81	*76	*81	Oc., 1925	0.05
Tonopah Extension	N. Y. Curb	*7	*6	*6	Ap., 1925	0.05
Tonopah Mining	N. Y. Curb	4	4	4	Se 29,Oc 20 SA	0.07½
West End Consol	N. Y. Curb	*3	*3	*3	Mar., 1923	0.05
Yukon Gold	Boston Curb	*74	*65	*65	June, 1918	0.02
SILVER						
Beaver Consol	Toronto	*85	*85	*85	May, 1920	0.03
Castle-Trethewey	Toronto	*39	*36	*36		
Coniagas	Toronto	3.30	3.00	3.00	May, 1924	0.12½
Keeley	Toronto	*43½	*37½	*43½	Mr.1, Mr.15 SA	0.04
Lorrain Trout Lake	Toronto			*50	July, 1925	0.05
Mining Corp. Can	Toronto	3.35	3.05	3.10	My.20, Je.13 SA	0.125
Nipissing	N. Y. Curb	3	2⅛	2⅛	Se.29, Oc.20 Q	0.07½

Stock	Exch.	High	Low	Last		Last Div.
SILVER-LEAD						
Ahumada	New York	3⅛	3⅛	3⅛	Ap., 1927	0.12½
Bingham Mines	Boston	46⅛	41	46⅛	Se.20, Oc.5 Q	0.50
Bunker Hill & Sullivan	N. Y. Curb	124	119⅛	119⅛	Se.29, Oc. 4 MX	0.75
Cardiff M. & M	Salt Lake	*42	*40	*40	Feb. 5, 1927	0.10
Chief Consol	Salt Lake	4.20	3.62½	4.10	Ja.10, Fe.1 K	0.10
Consti'n Mng.&Mill'g	Spokane	*38⅛	*36	*38⅛		
Erupcion	Boston Curb	*35	*25	*35	Ja., 1928 Q	0.07½
Eureka Lily	Salt Lake	1.85	1.52½	1.52½		
Federal M. & S	New York	160	151	151	Je., 1927	10.00
Federal M. & S. pfd	New York	101	101	101	Au. 24, Se. 15 Q	1.75
Golconda	Spokane	*78⅛	*76⅛	*77		
Hecla Mining	N. Y. Curb	14⅞	14⅛	14⅛	Au.15, Se. 1 Q	0.15
Highland-Surprise	Spokane	*13⅛	*11	*12⅛		
Iron King Mining	Salt Lake	*87	*85	*85		
Keystone Mining	Salt Lake	†2.35	†2.25		Fe., 1926	0.07½
Lucky Jim	Spokane	*26	*25	*25⅛		
Lucky Tiger-Com	Kansas City	†7.00	†6.65		Oc.4, Oc.20 M	0.05
Mammoth Mining	Salt Lake	1.45	1.45	1.45	De., 1926	0.25
North Lily	Salt Lake	7.90	7.85	7.85		
Park Utah	New York	11⅛	10⅛	10⅛	Se.,11, Oc.1 Q	0.20
Plutus Mining	Salt Lake	2.00	1.95	1.97½	Ap.10, Ap.16 Q	0.10
Rico-Argentine	Salt Lake	*52	*50	*50	June 15 Q	0.03
Sherman Lead	Spokane	*23	*21	*21		
Silver King Coal	Salt Lake	13.50	13.37½	13.37½	Se.20, Oc.1 Q	0.25
Silversmith	Spokane	*14⅛	*11	*12⅛	Oct., 1926 Q	0.02
Strattons Mines	Spokane	1.37	1.25	1.30		
Sunshine M. Co	Spokane	1.47	1.40	1.40	June 20, K	0.02
Tamarack-Custer	Spokane	*45	*40⅛	*42	Sept., 1924	0.25
Tintic Standard	Salt Lake	14.25	14.12½	14.12½	Se.19, Se.29 QX	0.30
Utah-Apex	Boston	4⅛	4	4	Jl.14, Au.1 K	0.25
IRON						
Bethlehem Steel	New York	70⅛	63⅛	68⅛	Jl., 1924	1.25
Cleveland-Cliffs Iron	Cleveland	1.45	1.40	1.42	Jl.14, Jl.25. Q	1.00
Colorado F & I, pfd	New York	71⅛	65⅛	66⅛	Au.10, Au.25 Q	2.00
Gt. North'n Iron Ore	New York	25⅛	23⅛	25⅛	Ap. 9, Ap. 30 K	0.75
Inland Steel	New York	71	67⅛	69⅛	Au. 15, Se.1 Q	0.62½
Republic I. & S	New York	83⅛	78	80	Au. 14, Se. 1 Q	1.00
Republic I. & S. pfd	New York	109	108⅛	108⅛	Se. 15, Oc. 1 Q	1.75
Sloss-Sheffield S. & I	New York	123⅛	120	123⅛	Se.10, Se.20 Q	1.50
Sloss-Snef. S.&I. pfd	New York			120	Se. 20, Oc. 1 Q	1.75
U. S. Steel	New York	161⅛	156	158⅛	Au.30, Se.29 Q	1.75
U. S. Steel, pfd	New York	141⅞	141	141⅛	Au. 6, Au. 30 Q	1.75
Virginia I. C. & C	New York			25⅛	Jan., 1924	1.50
Virginia I.C.&C. pfd	New York			50	Je. 16, Jl. 2 SA	2.50
DIAMONDS, PLATINUM, ALUMINUM, VANADIUM, TIN						
De Beers Consol	New York			24⅛	Ju.16, Ju.26 K	0.97
So. Am. G. & P	N. Y. Curb	4	3⅛	3⅛		
Alum. Co. of Amer	N. Y. Curb	138⅛	135⅞	138⅛		
Alum. Co. of Amer. pf.	N. Y. Curb	107⅞	107⅞	107⅞	Se. 15, Oc. 1 Q	1.75
Vanadium Corp	New York	82	77⅛	79	Au. 1, Au. 15 Q	0.75
Patino M. & E	New York	39⅛	34⅛	35⅛	April, 1928	4s.
ASBESTOS						
Asbestos Corp	Montreal	27	25⅛	25⅛	Jan., 1926	1.50
Asbestos Corp. pfd	Montreal	89	88	88	Se.29, Oc.15 Q	1.75
SULPHUR						
Freeport Texas	New York	60⅛	54⅛	56	Oc.15, No.1 QX	1.25
Texas Gulf	New York	72⅛	68⅛	69	Se. 1⅛, Se 15 Q	1.00
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	52⅛	48⅛	49	Au. 21, Se 1 Q	0.75
Amer. Metal, pfd. 6%	New York			110	Au.15, Se.1 Q	1.50
Amer. Sm. & Ref	New York	248⅛	238	248⅛	Oc.11, No.1 Q	2.00
Amer. Sm. & Ref. pfd	New York	135⅛	135	135⅛	No.2, De. 1 Q	1.75
Consol. M. & S	Montreal	268	264	264	Je.30, Jl.16 SA	6.25
Newmont Mining	N. Y. Curb	174⅛	164⅛	165⅛	Se.28, Oc.15 Q	1.00
U. S. Sm. R. & M	New York	54⅛	51	51	Oc.5, Oc. 15 Q	0.87½
U.S. Sm. R.&M. pfd	New York	54	53	53	Oc. 5, Oc. 15 Q	0.87½

*Cents per share. †Bid or asked. Q, Quarterly. A, Annual. SA, Semi-annually. M, Monthly. FW, four weeks. K, irregular. I, Initial. X, Extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, J. A. Hogle & Co.; Colorado Springs, Colo., Henry Sachs.

LONDON QUOTATIONS—WEEK ENDED September 25, 1928

Name	High	Low	Last	Date	Amount	Last Div.
Alaska Mexican ($5)	35/6	35/—	35/—			
Alaska Treadwell ($25)	120/6	120/—	120/—	Nov., 1926	4 (d)	
Aramayo Mines (25 frs.)	58/9	56/3	58/9	Aug, 1928	5 p.c. (†)	
Burma Corpn. (10 rupees)	15/1½	14/4½	15/—	Aug., 1928	6 annas*	
Bwana M'Kubwa (5s)	8/6	7/6	7 7½			
Camp Bird (2s)	4/7½	4/1½	4/4½	April, 1928	16⅔ p.c.	
El Oro (£1)	4/9	4/3	4/9	Nov., 1924	2½ p.c.*	
Frontino & Bolivia (£1)	10/6	10/—	10/—	July 1928	3¾ p.c.	
Mexican Corpn. (£1)	10/1½	9/3	9/9			
Mexico Mines of El Oro (£1)	21/—	20/—	20/—	Dec., 1926	3¾ p.c.*	
Mond Nickel	136/6	106/3	132/6	Aug., 1928	20 p.c.	
N'Changa Copper Mining	20/—	18/7½	19/9			
Oroville Dredging (£1)	3/6	3/3	3/6	Dec., 1923	3¾ p.c.	
Rhodesian Congo Border (£1)	31/6	30/—	30/—			
St. John del Rey (£1)	12/3	11/6	12/—	April, 1928	7½ p.c.	
San Francisco Mines (10s)	28/6	27/3	28/4½	July 1928	12½ p.c.	
Santa Gertrudis (£1)	14/—	13/6	19/9	July 1928	7½ p.c.	
Selukwe (2s. 6d.)	10/1½	9/1½	9/6	April, 1917	6¼ p.c.	
S. Amer. Copper (2s.)	2/6	2/—	2/4½	Nov., 1917	75 p.c.	
Tanganyika (£1)	68/1	58/1½	63/1½	July 1928	5 p.c.	
Union Miniere du Haut-Katanga (Brussels)	11,050	10,725	10,950	July, 1928	182.60 (b)	

*Free of British income tax. †Swiss francs and plus 15 p. c. bonus. ‡Belgian frs. and free of taxation.